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FLYING

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THE COVER: Red-tipped P-80's can be spotted quickly if forced down in snow away from base. Photo by Erik Miller.

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FLYING

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NATIONAL POLICY

Even Yesterday May Not Have Been Soon Enough...William B. Ziff..13

CIVIL AVIATION

Global Joy-Ride.....Gaither Littrell 15
The Feast Was Over the Mountain.....Bob Arentz 27
Helicamera..... 34
Are Flight Tests Useless?.....Kurt Rand 36
FLYING's Check Pilot—The Temco Swift..... 39

AIRPORTS AND OPERATIONS

This Is Private Flying.....George E. Anderson 17

ENGINEERING

Jack Northrop and His Wonderful Wing.....Rus Walton 19
The MAD Prospectors.....William Welsh 30
What's Wrong with Omni-Range?..... 37

AIR COMMERCE

Noah's Flying Ark..... 22
Tourists' Airline..... 24
Home in a Clipper.....E. W. Sudlow 26

WHERE TO FLY

FLYING Holiday:
Nogales: Arizona's Borderland..... 40

MILITARY

The Brass-Hat Squadron.....C. Budd Dugan 32

DEPARTMENTS

The Mail Box..... 6
Jottings..... 8
Report from Washington.....Fred Hamlin 42
Have You Seen?..... 43
I Learned About Flying from That!—No. 99.....Robert N. Ward 46
AOPA News..... 48
Fifteen Years Ago..... 52
Do You Know?..... 70
Photo Credits..... 84

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THE MAIL BOX

G. I. TRAINING

In the article "Is G.I. Training Good for Aviation?" (December issue), I think the arguments for both sides were well-founded.

I should like to ask William Welsh to take into consideration the GIs who are taking flight training for a definite purpose. Granted there are some students who aren't going to follow through with flying, just as there are GIs in other than flight schools who are taking training because the Government is paying the bills.

But I contend that this is rare. The students who are getting benefits out of it should not be deprived of the opportunity because a few GIs are taking advantage of a good thing.

I am taking flight training at present with a definite object in mind and I find that the other students taking training here are in earnest.

JAY G. LAWRENCE

Ft. Lauderdale, Fla.

THOMPSON TROPHY RACE

I share the views of "A 1947 Participant" who wrote the letter about the Thompson Trophy Race in "The Mail Box" (December issue). It didn't take some one on the inside to figure that the Navy was out to set all the records it could.

It hardly seems logical that the Navy should use a brand new design, with about 15 hours time in the air, to attempt a new record. Seems to me they were in a big hurry to get that record with the *Skystreak* before the National Air Races. Then to make the situation complete, they donate the three *Corsairs* to assure a clean sweep of the Thompson. It's too bad one of the planes had to kill its pilot and mar the Navy's record.

E.L.E.

Tucson, Ariz.

Primarily, the Thompson race is an open race for privately-owned airplanes. Every plane that entered the race qualified under this category, including the *Corsair*.

Each pilot who flies in the race must not be affiliated, on active duty status, with the service. All of the *Corsair* pilots were former Navy-trained pilots but they were all civilians at the time of the race and none of them had flown the F2G while in service.

Every plane that flew in the subject race was a former Army or Navy plane purchased as surplus material. The expense for development of each was probably parallel. The *Corsair* F2G was developed to intercept low altitude Kamikazi attacks and is not in production and was not finished in time to be used in the fleet. Less than 20 F2Gs were built and this model is not used today by the Navy.

The participant's letter indicated that the *Corsairs* had been readied at the Naval Air Station, Olathe, Kan. This is a ridiculously erroneous statement. Only one of the planes had ever been at Olathe and it was not touched as far as maintenance is concerned. All work was done at the Kansas City Municipal Airport by civilians.

If there were any service personnel at Cleveland servicing the F2Gs I am certain they were on leave and their activity was not governed or sanctioned by the Navy. Summing the whole situation up, the Thompson Trophy Race was won by surplus *Corsairs* in competition with surplus Army fighter planes—so where is the gripe?

My opinion is that the spectators enjoyed the race and everyone was happy except the participant who did not win or place.

RON G. PUCKETT

Olathe, Kan.

● Reader Puckett flew a *Corsair* in that race.—ED.

"THIS IS PRIVATE FLYING"

The series you have started on "This Is Private Flying" by George E. Anderson is a standout and as far as we are concerned, it is going to be required reading for all Ryan *Navion* distributors, dealers and other sales representatives.

WILLIAM WAGNER
Public Relations Manager
Ryan Aeronautical Company

San Diego, Calif.

Our congratulations to you on starting a survey of this kind.

Without question, operators and manufacturers do not like to admit that Mr. Anderson's findings are true. However, as the old saying goes "if the shoe fits, wear it" and I'm afraid we'll have to wear it and do something about it. We know that conditions of this kind exist and we are trying our best to overcome them. Articles of this kind without doubt will help tremendously in speeding up better private flying.

P. H. SCHERER
Manager, Service and Parts Dept.
Aeronca Aircraft Corporation

Middletown, O.

In connection with the airport markings I can certainly say "amen." Out of the scores of airports I have been in across the nation I have found that very few have adequate markings, and without the sectional map to identify the airport it would be impossible to know what

(*Continued on page* 83)

How to choose the RIGHT Plane

Here's a quiz to test your ability to find the plane that gives you the *finest balance* of all the qualities you want. It will help you find out what to look for and where to find it.

1 **FINE CRUISING PERFORMANCE,** without sacrificing other equally important qualities, is a must. Here are cruising speeds being obtained by owners of three different 4-place personal planes. Can you pick the *Navion's?*

☐ 120 mph ☐ 150 mph ☐ 162 mph

2 **BOTH VETERAN AND NOVICE** pilots say the 4-place *Navion* is EASY-TO-FLY. What do you think is the outstanding reason?

☐ Exceptional stability in rough as well as smooth air
☐ Ingenious stall-resistant wing design
☐ Interconnected rudder and ailerons

3 **VERSATILE LOAD CAPACITY** means greater utility. The exceptionally roomy and comfortable *Navion* can be quickly converted to fly bulky cargo. Check the net payload you think the *Navion* delivers.

☐ 455 lbs. cargo plus pilot and passenger
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☐ 55 cubic feet of bulk load

4 **SAFETY** is an outstanding *Navion* characteristic... unequalled by any plane in its class. Can you pick the reason why?

☐ 360° cabin visibility
☐ Aileron control even below stalling speed
☐ Extremely rugged, all-metal, thick-skinned construction throughout

5 **SHORT-FIELD PERFORMANCE** is also an outstanding *Navion* quality. Here are the take-off and landing performances of three planes. Can you spot the *Navion's?*

	TAKE-OFF	LAND
☐ 1.	585 ft.	490 ft.
☐ 2.	765 ft.	565 ft.
☐ 3.	560 ft.	335 ft

ANSWERS:

1. 150 mph. Designed by top North American engineers, the *Navion* could have been made faster or slower, but experience proves *Navion* design gives high performance while retaining ideal stall and landing characteristics, ruggedness and other "musts" for safety and satisfaction.

2. If you picked one or all, you're right! *All* are *Navion* qualities that make both beginner and veteran pilots say: "Easiest, safest plane to fly!"

3. All three are correct, because all three are variations of *Navion's* load capacity. Canopy is temporarily removable for easy bulk loading.

4. Again, if you picked one or all, you're right. The Ryan-refined *Navion* "forgives" every flying error short of deliberate foolhardiness.

5. No. 3 is correct! *Navion's* 185 hp engine and variable-pitch propeller give short, easy take-offs with abundant reserve power. Hydraulic flaps, shock absorbers, and tricycle gear with steerable nosewheel give smooth, safe landings even in cross winds and on rough fields.

Give yourself 20 points for each correct answer. If you scored 100 you're a man who knows airplanes...and the 1948 *Navion* is your best bet. A score of 80 or 60 means you're well on your way to getting the most for your money. If you got 40 or less, you'd better write today on your letterhead for our fully illustrated brochure and a demonstration by your nearest dealer.

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SIGNED 7-1-47 Carl D. Ettinger

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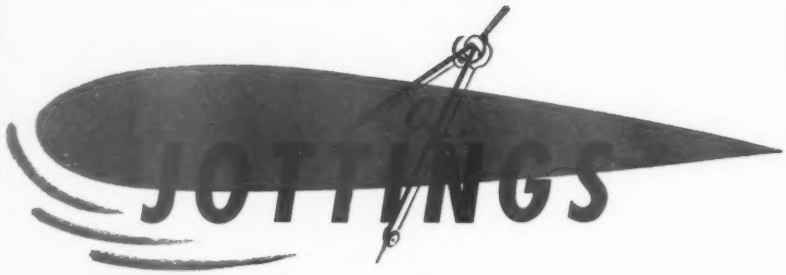

. . . **Cockpits of sonic planes** flying at 760 m.p.h. require cooling equal to that supplied by 40 household refrigerators to make them liveable. This job is being done now by a 16½-pound AiResearch refrigeration unit—a miniature disk of aluminum about the size of a dollar which whirls more than 100,000 times per minute. Composed of an air expansion cooling turbine and an air-to-air heat exchanger this unit must drop jet engine air temperatures from over 500° to less than 40° during high speed flight. Without it, cockpit temperatures would reach 212°.

. . . **Water wings** have been used successfully by the Germans to assist seaplanes in take-off, according to a report by the Office of Technical Services. Tests made on a two-pontoon seaplane proved the water wings to be a highly effective lifting device. Plans are being made to use a series of these arched wings on large seaplanes, retracting them into the hull after take-off.

. . . **A $13,200 prize** has been awarded three aircraft engineers of Aeromatic Propeller Dept., Koppers Co., by the James F. Lincoln Arc Welding Foundation. The three, Clarence C. Mast, Paul F. Hacketal, and Douglas W. Hamilton, received the award for their design of a low-cost, variable-pitch welded propeller hub for lightplanes. (Photo above.)

. . . **The 1948 Ryan Navion** has made its debut with added major refinements and new standard equipment. These include high-gloss enamel finish available in four colors, new interior styling, improved ventilation and temperature control, perfected sound insulation, new fuel system, and range increased to 750 miles at 150 m.p.h. cruising speed with 20-gallon auxiliary tank. Price has been raised to $8,750 f.a.f. San Diego.

. . . **Military version of the Martin 2-0-2** will be able to carry 40 fully equipped combat troops or paratroopers, or 36 litter patients and four medical attendants. Its large cargo door, 6x8 feet, permits loading of jeeps or engines. The commercial version of the 2-0-2 was recently demonstrated to military personnel.

. . . **An automatic radio compass for lightplanes** is now in production by Lear, Incorporated. The compass can be supplied with a special kit for installation in light aircraft. The kit includes special dust cover and dress panel to fit the tuner unit into the glove compartment of nearly all small aircraft. Price: over $1,000. (Photo above.)

. . . **CAA inspectors** may rent planes from local private flight contractors if a plan now under consideration goes into effect. It was recommended to enable CAA inspectors to cover their extensive itineraries by air throughout the year within the limits of appropriated funds. It would also be a source of additional revenue for fixed-base operators. The aircraft would be rented on a yearly contract basis.

. . . **Northrop's Pioneer** surpassed its designers' hopes when flight tests disclosed it could land and take off in as little as 400 feet instead of the designed 700 feet. Northrop test pilots have made flights in the three-engined feeder line transport to many California airports used only by lightplanes. Even at the 7,000-foot altitude Big Bear airport, the *Pioneer* required no longer landing and take-off run than two- and four-passenger lightplanes.

. . . **Flying turtle-egg hunter** Frank E. ("Pappy") Crowell isn't bothered by the high price of eggs. He just hops in his 10-year old *Cub* and goes hunting for sea turtle eggs. Flying low, he watches for the tell-tale tractor-like tracks made by the turtles as they plow their way out of the sea and up above highwater mark to build nests. Landing on the beach he digs up the eggs (150 to a nest), puts them aboard and takes off for another search. Turtle eggs are said to be especially good for cakes. END

The new year is ahead of you. Now is the time to stop, think and PLAN! What is your future? A lifetime of drudgery and "just getting by"? Or a well-paid, interesting career in Aviation — the young, growing industry that is full of opportunities for alert men with sound, practical training? *Spartan can give you that training.* Intensive, thorough courses packed with the latest aeronautical know-how — practical experience on "live" aircraft under the guidance of industry-wise instructors who can teach time and effort-saving methods — the latest training equipment, exactly like that with which you will work after graduation. Don't wait! Aviation will not wait! Plan now to make next year, and all those to follow, fascinating ones of security and success for you.

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Sports Afield Magazine

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FLYING
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1948

Even Yesterday May Not Have Been Soon Enough

AFTER having fought two bloody and costly wars to save the world for democracy, the United States again is faced with the necessity for large-scale military preparation against the possibility of another and even worse and more devastating war.

This is undoubtedly a catastrophe in human relations. It would be infinitely preferable to exist in a law-abiding world devoted to conciliation, common sense and justice, rather than in a chaotic universe where the sweat and effort of men must be poured into the great human waste of military armament. While all this is true, it is also true that as far as world law is concerned, it is recognized more in the breach than the practice. In this sense of impending trouble, the world is far worse off than during any period which preceded the vicious struggles of World Wars I and II.

If ever there was a time when our nation had to take stock of its situation and prepare for the worst, yesterday was that time. Even *now* may not be soon enough. This is the undeniable conclusion to be derived from the name-calling, contentions, power maneuvers, and conspiratorial action now taking place between the nations on all fronts of human endeavor and interest. Not even the usual diplomatic subtlety remains to lend an air of doubt to the gravity of the situation. This condition combined with the present very real military weakness of America, is sufficient to freeze the blood of thoughtful men in their veins.

We have pretty well deluded ourselves into the belief that we can save the peoples of the world against themselves by acting as a sort of banking Santa Claus, while at the same time stripping our essential defenses at home. This is a sort of madness which grips the minds of men otherwise sensible and sane. Whatever the explanation, is immaterial, as it was in the case of the French Republic in its blind disregard for the actual military power of Nazi Germany, or in other classic blunders of national policy now written in the history books. The cold fact is that our present military force is thoroughly inadequate, and that we are losing the armament race to which our future security is tied.

When we advance such unsound schemes as mass conscription, and embalm the weapons and engines of yesterday in vaseline and goosegrease for purposes of use tomorrow, we are committing a pathetic act of national folly which bears little sensible relation to the conditions under which a future war must be fought.

Even in times not dominated by the mechanical sciences, a nation is compelled to build its armed forces according to the conditions demanded by the war emergencies it might have to face. A mass army in the hands of the Kremlin, conceivably could be an effective instrument for use in overrunning its immediate borders. For the conditions which would face the United States, no armed force could be of the slightest real value except one built around the central problem of adequate air power. Questions of transport, striking power, and distance, dictate this conclusion as certainly as England's isolation in the North Atlantic dictated her early reliance upon sea power.

Today, also, it is increasingly clear that military operations must be considered in terms of entire continents, rather than of miles, or strong defensive positions. There no longer are offensive and defensive combat operations —there is only *war*, in which the entire nation is the combatant, and where industrial production is as important as the active military spearhead.

Modern strategy is at least 90 per cent weapons. The remaining 10 per cent is pretty largely a question of combatant will, and of the determination to bring the issue to a quick and decisive conclusion, so as to avoid the eroding effects of attrition on the national organism. The readying period for this type of struggle is more apt to be the decisive one than the functioning operations in the battle theatres.

The fact is simple and uncontestable: whoever rules the air ocean will rule the world. It is as clearly evident that we have viewed complacently the rapid disintegration not only of the once mighty American air forces, but of our equally magnificent aircraft production facilities. Taken together or separately, they amount to an actual liquidation of America's ability to fight an effective war.

Air power in the sense demanded by the national welfare does not mean a collaboration between three separate and distinct services. It means a military establishment dominated in all its parts by the air arm. It means, also, a fully integrated and rounded air development involving a healthy producing industry, a suitable national private flight program, a modernized, rapidly expanding air transport system, and a massively coordinated program of aviation research.

Revolutionary processes in weapons and carriers still are going forward. The military refinements which pro-

ceed from advances in aeronautical engineering and its related sciences, are swiftly thrusting existing models into obsolescence. Even relatively minor changes in power plant, mobility or fire power, can have decisive effects, as the Germans discovered in their ill-fated air invasion of Britain.

To place any sensible program of national defense into operation requires a recognition on the part of the highest policy-making bodies that the defense of the United States is essentially an air defense, as well as a full understanding of the fact that a strong military air arm is a composite of all the factors which would make America paramount in the air. Not even private flying can be disregarded. Private flyers will provide a pool of qualified men suitable to quick combat training; such men and their machines would be additionally useful for crucially required liaison work, or for sudden and unexpected emergencies where rapid mobilization and transport were essential. The workers, engineers, and facilities employed in the plants manufacturing private planes, quickly could be shifted to the production of war planes and combat parts.

What is needed is an all-over air program which recognizes the intimate relationship of each phase of air activity, research and construction, with the others. The commercial and financial stability of the aircraft manufacturing industry alone is an all-important factor in the American program of defense.

Aircraft production is increasingly costly and complex. It requires markets. It cannot be operated on peanuts. In 1946, the aircraft industry had an eighty-two million dollar deficit. 1947 will be worse. At the present rate of decline, the condition could border on the catastrophic from the national point of view.

Thus, the expansibility of the aircraft industry, or its capacity to quickly meet the exigencies of war, is at low ebb. The coordination of essential research is poor, and the amount of money spent in this direction is niggardly compared to the need. The development of guided missiles, which may hold the key to future military success, has hardly been scratched. Our own knowledge and experience in this field is extremely sketchy. It is estimated by Harry Woodhead, president of Consolidated-Vultee Aircraft Corporation, that the development of a first-class long-range missile program would cost between two and three billion dollars, and take 10 to 15 years of intensive research, experimentation, and flight testing.

Russia today is reliably reported to be far ahead of us in organized aeronautics research and in experiment in the related physical sciences. Despite our present facilities in production and air traffic, the inevitable outcome must be compared to the advent of a lion cub in a pen of cattle: it is only a question of time and organization until the killer potential becomes a grim reality.

The Russians are known to have acquired a great part of the German aeronautical experience in the shape of qualified engineers, flight experts, and technicians. In the guided missile program, Moscow is far ahead of us. A V-6, and other rocket-propelled missiles, are reliably reported to be in extensive production at Tcheliabinsk. It is a practical certainty that the flying globes and mysterious lights seen by the Swedes in the northern skies are evidence of feverish Russian experimentation in rocket devices. The Russians are reliably reported to be spending more money on the development of their national air arm than the entire U.S. defense budget for all forces put together.

The Russian Communist general, Gutichvili, now an exile in Paris, has stated from his knowledge that the Kremlin is putting all possible resources into a thorough study of the newest secret weapons, and that the Soviet army is expected to be ready for any contingency within five years. British military experts now are inclined to believe that the present power of the Red armed forces has been sadly underrated. Certainly, at a time when our own air power has slumped, the efficiency of the Red air force has greatly increased since the close of the war.

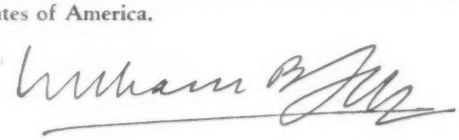
Even hard-pressed Britain is vastly outdoing us in essential aeronautical research and in the attention given its aviation industry by the government. Britain is far ahead of us in the development of such advanced designs as propeller-turbine engines, aviation-linked electronics, and in transonic and supersonic speed experiments. Her state-controlled aviation industry is being advanced with all the power of an alert and determined government. London is spending close to one and one-half billion dollars in a single scheme of newly-established aeronautical research and experimentation.

Here it is interesting to note that Britain is devoted to principles of State planning which, by definition, are not much different than those of the Soviet Union as far as ultimate goals are concerned. There is no guarantee that London will be on our side in the event of another war, despite the fact that it is we who are financing her massive plans for State socialism. Britain has swung far more left than anyone cares to realize; with the general hostility to the American capitalist system so deep-seated within the government as to be for practical purposes almost irreversible.

We are constantly warned by our political leaders that the coming year will be a year of growing crises, and of very real anxiety. Developments, we are told, could be extremely rapid, with the international sky overcast with grave dangers.

This writer, for one, is willing to take the administration's word for it.

But what is required first in order of priority is not the hanky-panky of vast money spending in Europe. It is rather a realistic effort to get ready for trouble. This means the biggest and soundest air establishment we know how to build—one fully abreast of all of the techniques modern research and operation can afford. It means, in short, a new Marshall Plan—but this time one for the United States of America.

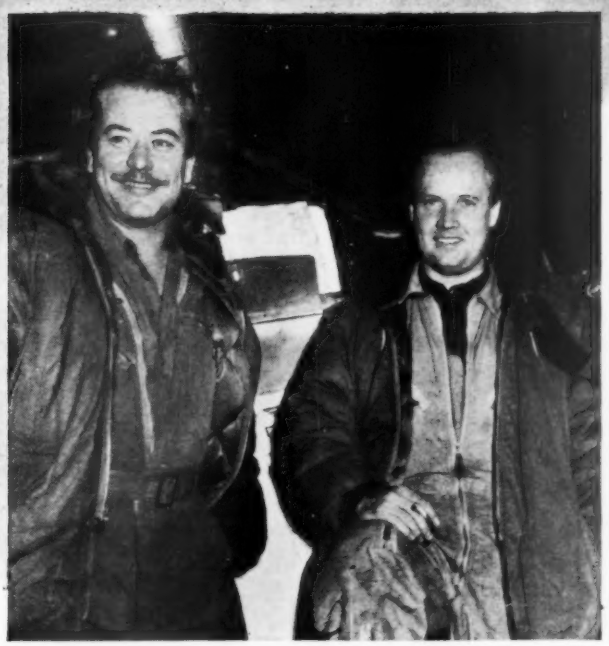


William B. Ziff

GLOBAL JOY-RIDE

Piper Super Cruisers which traveled around the world bear NX numbers because special equipment gave them 500-lb. overload.

Two able lightplane pilots circle the earth with the aid of special equipment, know-how—and a horseshoe.



World flyers George Truman and Clifford Evans land at Los Angeles after covering 22,500 miles in four-month global flight.

By GAITHER LITTRELL

West Coast Editor of FLYING

GEORGE TRUMAN, Los Angeles, and Clifford V. Evans, Washington, D. C., have just completed the "impossible"—a 25,000-mile flight around the world in two overloaded Piper *Super Cruisers*.

They did it on a shoestring, a horseshoe and a gasoline credit card.

They said their flight firmly establishes the utility of private planes; proves that "sane piloting can accomplish miracles," and that "the kind of airplane you buy off a showroom floor is capable of flying around the world."

Their two small craft were not the same as other *Super Cruisers* "off the showroom floor," though. They were both built around used airplanes given them free by the Piper Aircraft Corp., new Lycoming 0-235-C engines purchased for $1 apiece, extra navigation instruments "donated" at greatly reduced prices, borrowed radios, and two extra gasoline tanks to give them each 100 gallons more fuel than standard types. All the extra equipment

Loop antenna dial on world-circling plane is checked by mechanic. Note life raft pack, suspended above pilot's seat.

made the planes 500 pounds above normal gross weight.

Dependability of the engines and the sturdy aircraft as they were buffeted by severe head winds, bad icing conditions, extreme heat, and rough runways was the most remarkable aspect of the trip. The worst mechanical failure was a partially damaged tail wheel. Yet the flight was with two planes, each of which had been in the air 244 actual hours when they headed east from Phoenix, Ariz., in early December for other eastern cities and then Teterboro, N. J.

The flight proves more about dependability than speed. The two pilots left Teterboro August 9, and 114 days (or almost four full months) later were just pulling out of Phoenix to swing across the country, with many other stops scheduled. Weather and sickness were their main obstacles.

It was the first time that any airplane—two in this instance—with only a 100-h.p. engine and of such small size has circumnavigated the globe, crossing both the Atlantic and Pacific Oceans. Wiley Post flew around the world in 1933 with the *Winnie Mae* but he had 575 h.p. Douglas "Wrong Way" Corrigan crossed the Atlantic in 1938 in a Curtiss *Robin*, powered by a 175-h.p. Wright *Whirlwind*.

Despite 47 stops and take-offs with heavy loads before reaching Los Angeles, and bad headwinds much of the way, Truman and Evans averaged a little less than six gallons of fuel per hour over the entire trip. Oil consumption was low because the new engines were carefully broken in.

The pair left the United States with little money. They had put most of their personal finances into preparations for the flight. Their gasoline credit card saved them spending cash, as did numerous official dinners and luncheons in their honor along the way. The Army Air Bases at which they stopped supplied them with meals at GI rates. At Los Angeles, friends picked up the tabs for a series of relaxing parties while an unexpected assist came on the last day of their stay when the Los Angeles Chamber of Commerce assumed a worrisome hotel bill.

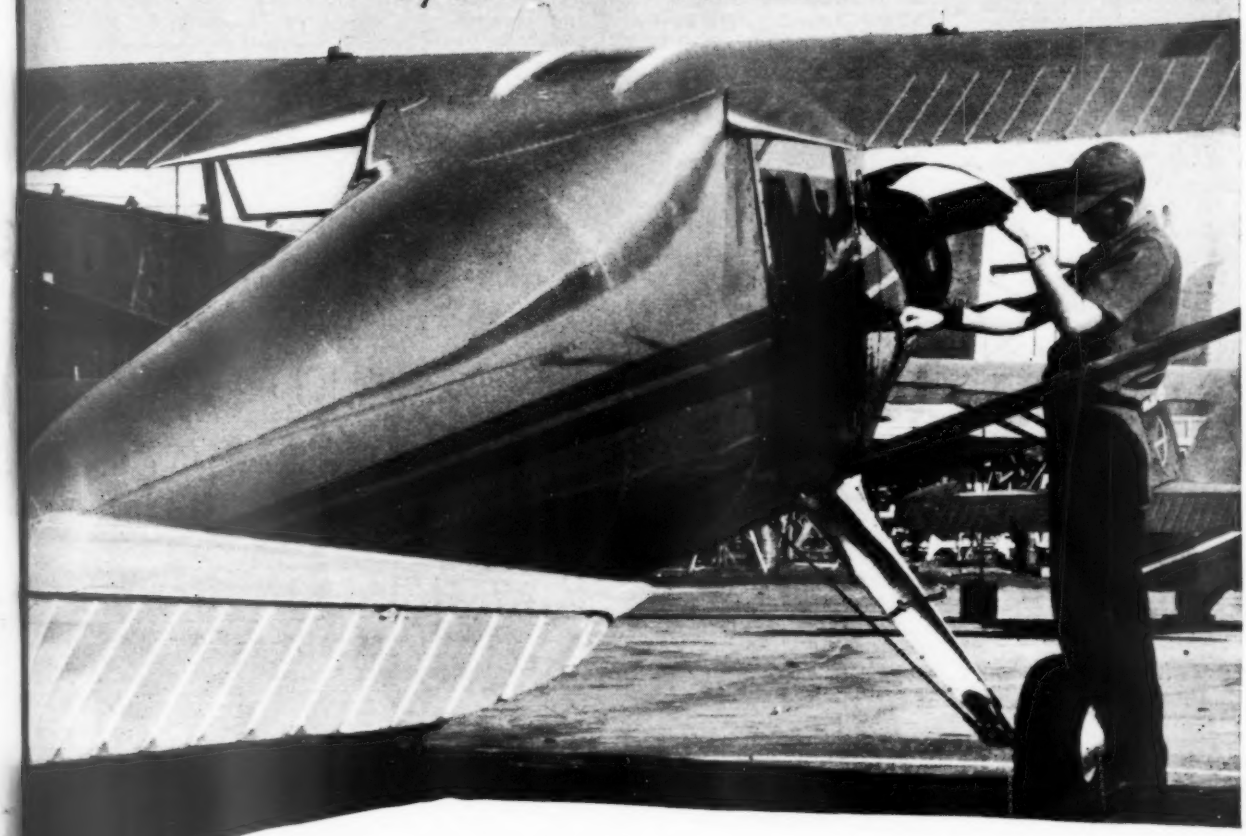
On the basis of what the flyers told a press conference, flying the world is expensive even in a *Super Cruiser*. But if Truman and Evans had had to pay for everything from start to finish they estimated it would have cost them $30,000. Now they hope once again to hear the jingle of cash through exploita- (*Continued on page* 62)

Two extra gas tanks, each holding 50 gallons, filled rear of both planes. Capacity of 138 gallons gave 2,400-mile range.

Dump valves for auxiliary fuel tanks could be opened by pilot during flight. They were necessary for landing emergencies.

This is Private Flying

By GEORGE E. ANDERSON



Author Anderson disconnects lower spark plug wire at Grand Central Airport, Glendale, Calif., before taxiing to maintenance hangar. Mechanic found the trouble immediately.

The author has been a pilot since 1940, an A&E since 1941. Because of his experience in checking "gripe" airports for AOPA, he was asked to make the survey on which these articles are based. During the war, Anderson worked on WTS and CPT programs, later was an engineer on B-29 engine nacelles and control surfaces. He is now maintenance director for an eastern aviation firm.

Not chiseling but lack of know-how causes maintenance gripes, FLYING survey finds.

THIRD OF A SERIES

OF ALL the complaints the private flyer has, he is most consistent when it comes to the maintenance of his plane and its accessories. His general impression is that any and all maintenance organizations are run by a brazen bunch of thieves. It was this impression that was primarily responsible for FLYING's conducting this survey. While the two preceding articles in this series have dealt with problems found by the average cross-country pilot, those have been secondary items when compared with the type of maintenance received by most private pilots.

On the first leg of my trip around the country I had maintenance work of one kind or another done on FLYING's Luscombe at 23 airports in 12 states. In all but one of these stops the work I had done had been "framed" in advance. It consisted mainly of crossing spark-plug wires, removing them, bending fixed trim tabs, tampering with the springs on the steerable tail wheel, and "accidentally" opening the primer. All of those, except for a

100-hour inspection at Tacoma, Wash., were relatively minor jobs.

However, before going any farther with the story of my experiences, I want to make clear some facts about the airplane I used. It was a brand-new Luscombe 8E with an 85-h.p. engine and starter. When I took delivery the airplane had had a total of 30 minutes' flying time, the amount put on it by the company's test pilot.

Nevertheless, to be sure the airplane was in as perfect condition as possible before starting on my trip through the southwest, west and northwest, both myself and Luscombe personnel went over NC-2686K once again with the greatest care. We found three minor faults in a test flight: the throttle was stiff, the carburetor-heat control crept, and the mixture was too rich. All these were fixed before leaving the factory; I made sure of that personally.

One other point: in certain ways, it was unfortunate that I had to use this airplane. It is all metal—metal fuselage, metal tail, metal wing, metal strut. Everything external is metal, in fact, except the rubber tires and wooden propeller. So it was a bit difficult for me to simulate a number of maintenance problems about which so many pilots with fabric-covered airplanes have complained. I had to improvise a bit, but I'm convinced that I found what I set out to find. Yet I think it only fair to point out that I used a particularly rugged, easy-to-maintain airplane. On the other hand, had I punctured the fuselage or dented a wing I suspect I would have had a fairly difficult time finding a shop equipped to do the job quickly and economically. I recall seeing two shops where that work could have been done efficiently—two out of 48 airports.

Now that I've completed the western part of my survey, I have arrived at two definite conclusions:

1. The average airport operator *is not a chiseler.* He frequently will go out of his way to "make right" a mistake or error in judgment, even though it may cost him money. He means to do right.

2. But the majority of airport operators and their personnel are flagrantly guilty of carelessness, atrocious business methods, unbelievable incompetence and no knowledge whatever of sound merchandising.

I realize, of course, that many readers will disagree with conclusion No. 1. Nevertheless, that is what I found—and I think I covered enough airports to get a good cross-section of the western United States. Five of those airports refused to charge me anything, although their mechanics had spent a minimum of 15 minutes working on the Luscombe in each place. At Tucson, I was charged for only six hours of helper time, although the mechanic and his helper worked at least eight hours on the plane. The mechanic insisted his bill should only be for the helper's time because he (the mechanic) had overlooked the obvious fact that the plug wires had been crossed (they had; another mechanic on the same field had carelessly crossed them after cleaning the plugs).

Messing up an engine is easy. Author Anderson disconnects lower plug wire to see whether mechanics will be able to find trouble. Another Anderson trick was crossing plug wires. Strangely enough, some mechanics seemed unable to locate the source of trouble.

My second conclusion, of course, is serious—extremely serious when you consider the welfare of the private flying industry. Thousands of lightplane owners have sold their airplanes in disgust in recent years, a fact that has been widely publicized. Numerous polls of those owners have shown unquestionably that my second conclusion would cover the majority of their complaints against airport operators. Why so many A&E mechanics are utterly incapable of even the most elementary trouble-shooting, for example, is something I cannot understand. Nevertheless, it is their careless or ignorant bungling that runs up a bill to the astronomical heights so often reported by irate plane owners.

On the other hand, though, I found a number of airports that obviously were sensitive to complaints of overcharging. To keep a customer's bill low, they were doing slipshod, superficial work although careful, thorough repairs should have been done regardless of the cost. This sensitiveness, I found, has bred another kind of danger—that of the "quick-and-dirty," cut-rate job. It deserves more investigation.

I got a 100-hour inspection in somewhat this manner at Tacoma, Wash. The job could not possibly have been done properly for what I (*Continued on page* 67)

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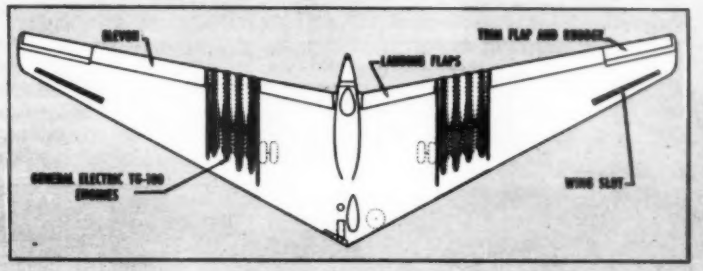
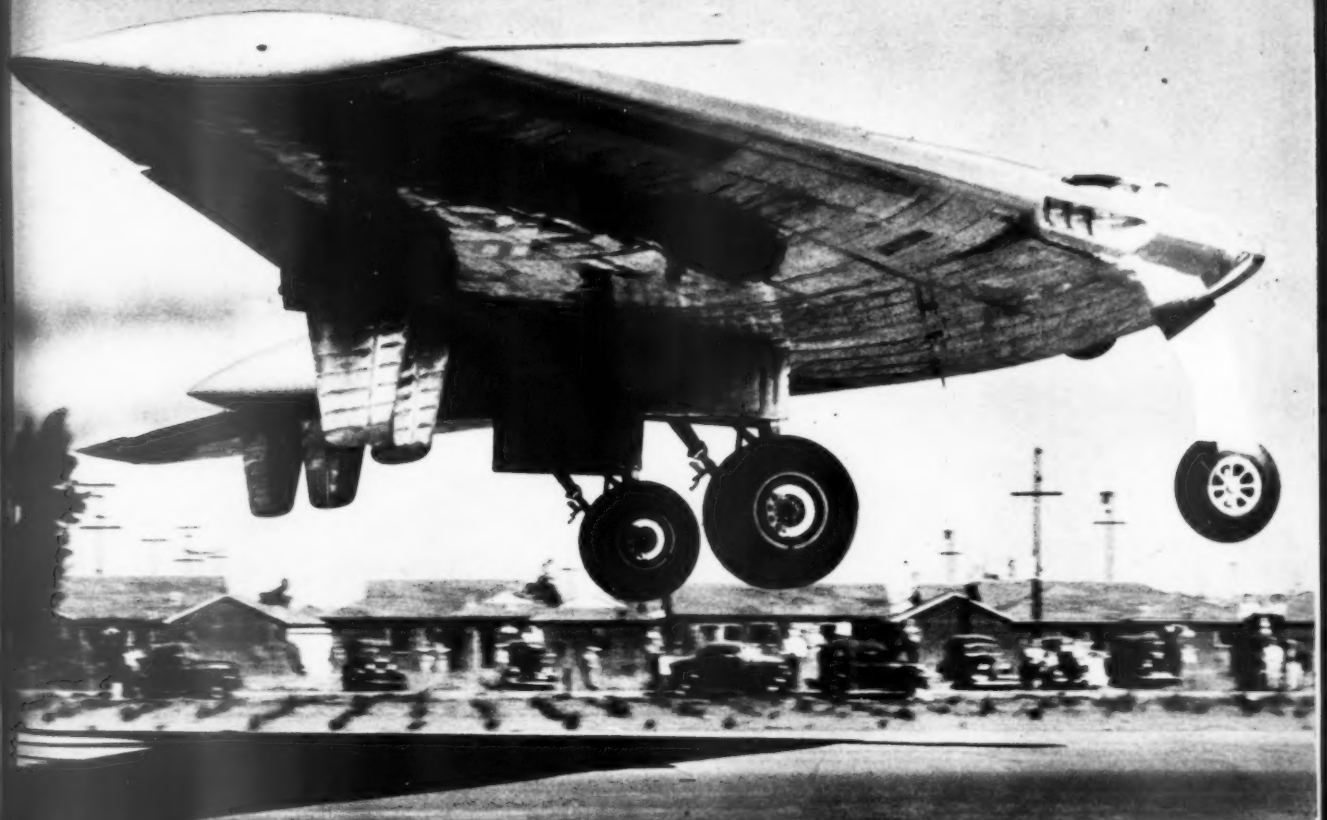
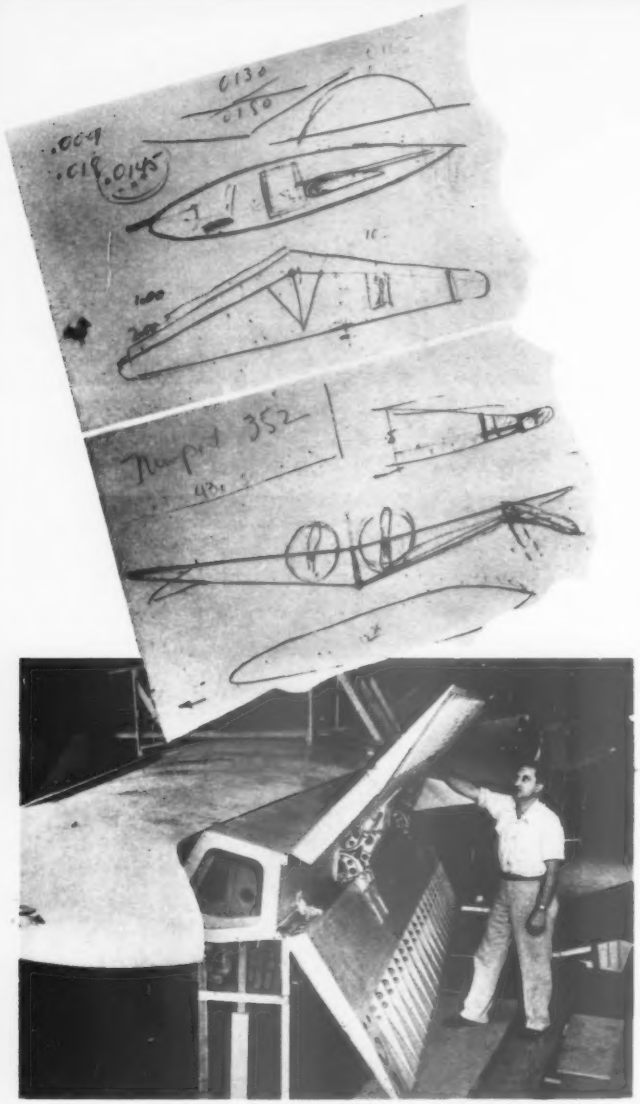
JACK NORTHROP AND HIS *Wonderful Wing*

John K. Northrop, president of Northrop Aircraft, Inc., has been experimenting with flying wings since 1923, when he made his first balsa models of tailless airplanes. His latest wing, the eight-jet YB-49 (right and below), is surprisingly similar in appearance to those early designs.





Eight-jet YB-49 climaxes 23 years of wing development . . .



Design ideas (top) were sketched by Northrop for N1M in 1939. Note drooping wing tips. Split flap (lower) sets up balanced drag.

Jack Northrop And His Wonderful Wing

continued

By RUS WALTON

THE world's largest jet bomber, which flew for the first time in October, is unique for more than its eight jet engines which deliver the equivalent of 32,000 horsepower. For the YB-49 is a flying wing, the latest in Jack Northrop's series of tailless craft which already have a lineage 23 years old. It is basically a jet version of its sister plane, the propeller-driven XB-35, which has been flying since June, 1946. This huge plane, with its 172-foot wingspread, was airborne in only 3,500 feet on its maiden run from Hawthorne Field, Calif., to Muroc Army Air Base.

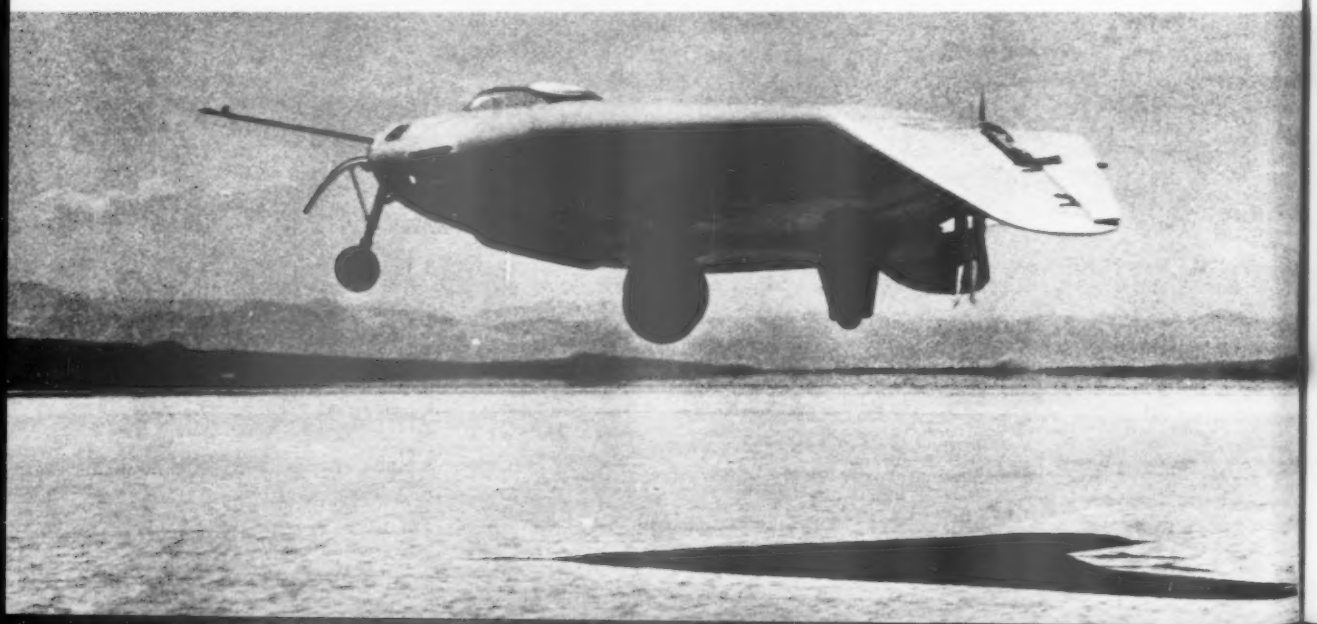
While most of its vital statistics are guarded by secrecy, enough is already known about this remarkable new airplane and its sister craft to hazard some guesses about its future. It is a future which appears brighter all the time. Yet only seven years ago, a few officials of one of America's foremost aeronautical research agencies scoffed openly when patents were filed on wing-type airplanes.

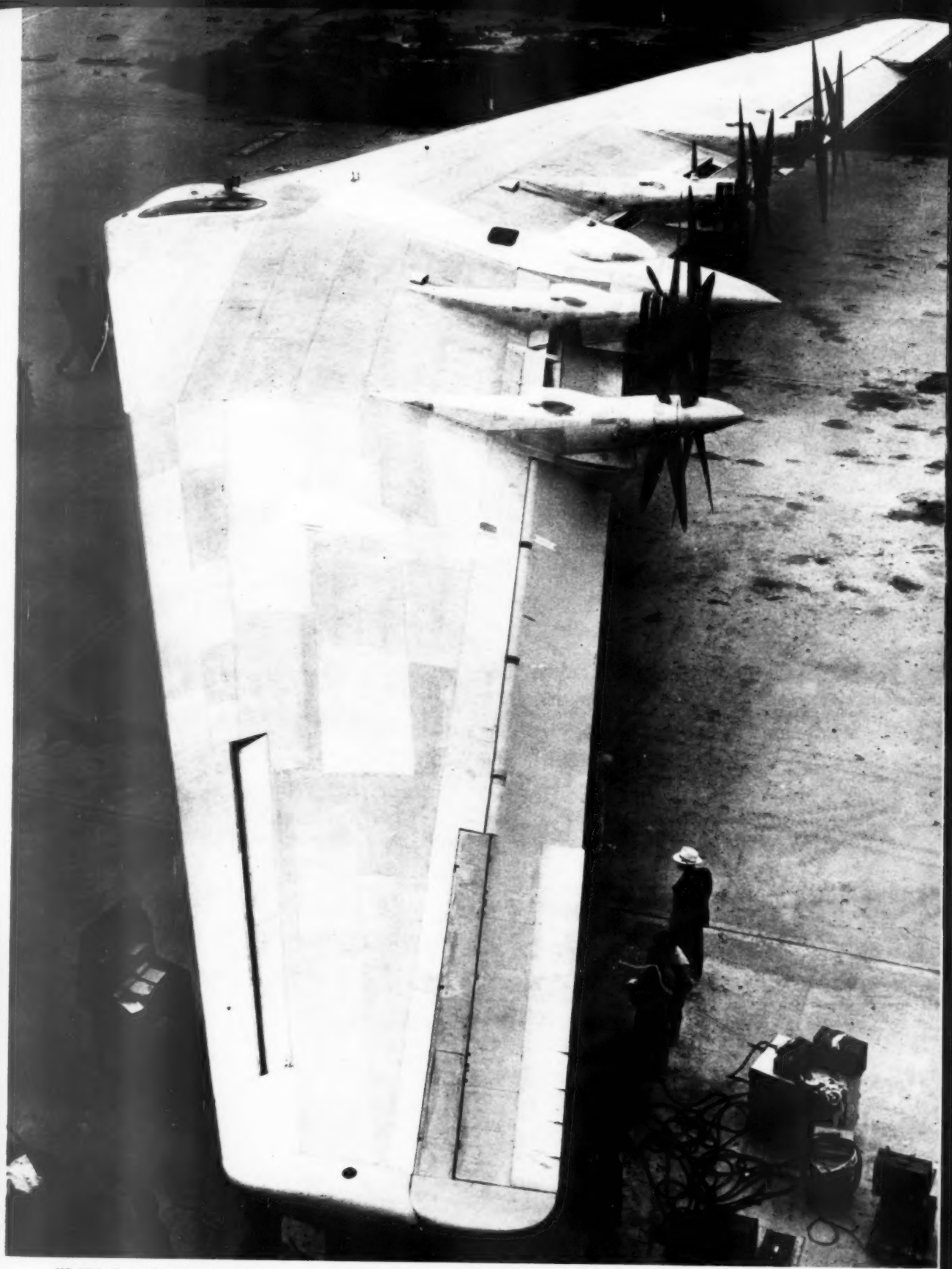
The man behind the YB-49 is John Knudsen Northrop, 51, aircraft designer, inventor, father of such famous conventional-type planes as the *Vega*, the *Alpha*, the *Delta* and the *Gamma;* and the military A-17, A-17A, BT-1 and the *Black Widow*. This is to say nothing of his family of wings—the N1M, N9M, XB-35, YB-49, and several flying wing missiles.

Although some leading aeronautical authorities still question the practicality of flying wings, Walter J. Cerny, director of engineering at Northrop, believes they have at least five advantages over conventional aircraft:

1. *Low-drag, high-lift.* All exposed parts create lift, have little drag. The wing can carry any weight faster. farther and cheaper than can a *(Continued on page* 56)

Early flying wing was N1M, with drooped wing tips for stability and three-bladed propellers. Drooped wing tips were later found unnecessary.





XB-35 is first of Northrop's giant wings. It is powered with four 3,000-h.p. Pratt & Whitney pusher engines. Empty weight is 89,000 pounds but plane can operate at 209,000 pounds. Wing span is 172 feet. Contra-props have given repeated trouble. YB-49 is a jet version.

Unloading the flying ark at Ontario, Calif., customs and animal inspectors carefully check the list of passengers. Zoo Director Glick (below) hands down a beautiful gibbon.

Noah's Flying Ark

Animal cargo arrives in tip-top shape after transpacific flight.

COULSON B. GLICK is a modern Noah who recently shepherded $75,000 worth of animals from the jungles of Siam, India and Malaya on a transpacific flight. Glick's cargo included 200 monkeys, 1,100 birds, two leopards, several baby elephants and an assortment of bears, pythons and cobras.

The trip from Bangkok, Siam, to Ontario, Calif., was the longest overwater flight in animal history. It kept Glick busy for a 52-hour stretch preparing special rations and feeding his charges. The only casualty was the death of one of the elephant babies of pneumonia just before arrival.

The biggest show of all occurred when a large delegation of children showed up to greet the arriving plane. The screaming of the animals and of the children created a bedlam. One baby elephant refused to leave the plane at first, but finally decided to risk it "after great persuasion." The animals were bound for various menageries. END

Ungainly-looking bird (above) is only one of 1,100 specimens brought here by flying ark. Customs Inspector Stanley Wilson looks at creature held by Coulson B. Glick, in charge of cargo.

Two of baby elephants in cargo were in a playful mood as plane landed. Only casualty of trip was death of third elephant baby by pneumonia. Another elephant had to be persuaded to leave plane.

Tourists' Airline

It may cost less than $1,000 to fly round world by AAXICO.

IF A young man named Seymour Kail has his way, he and a few others who have survived the stiff post-war non-scheduled transport competition will soon be flying you around the world for less than a thousand dollars. And you will be able to name the route you want to take.

Kail will do it by what he calls "second class air transport," as contrasted with the first-class now offered by the scheduled airlines. He and fellow non-skeds propose to sell it—the Civil Aeronautics Board permitting—in competition over scheduled routes now operated under CAB certificates.

"Second class," as outlined by Kail, differs from first only economically. Passengers have just as comfortable seating but don't have to make reservations for it, since DC-3s are equipped to carry as many as 40 passengers on short hauls, and 30 on longer hauls, with extra escape hatches. Otherwise, all that is eliminated in second class air travel are expensive ticket offices (you buy from the hostess), baggage handling (you do it your- *(Continued on page 60)*

Two AAXICO DC-3s are part of five-plane fleet of Douglases operated by this airline. Passenger rates are only 3.5 cents per mile.

Major overhaul on transport is made by experienced airline mechanics after 850 flight hours. AAXICO planes are safe; in about two years of operation, the non-scheduled airline flew some 50,000 passengers over 90,000,000 passenger miles without an accident.

President Howard J. Korth has built up big tourist business by keeping passenger rates down.

Operations executive, Seymour Kail, wants airline to compete with scheduled carriers.

Spare-parts inventory is valued at more than $250,000. Maintenance of the airplanes is given top priority, although some of passenger frills are not part of regular service.

One-half the dining room in the converted Sikorsky VS-42B shows little change from the original interior.

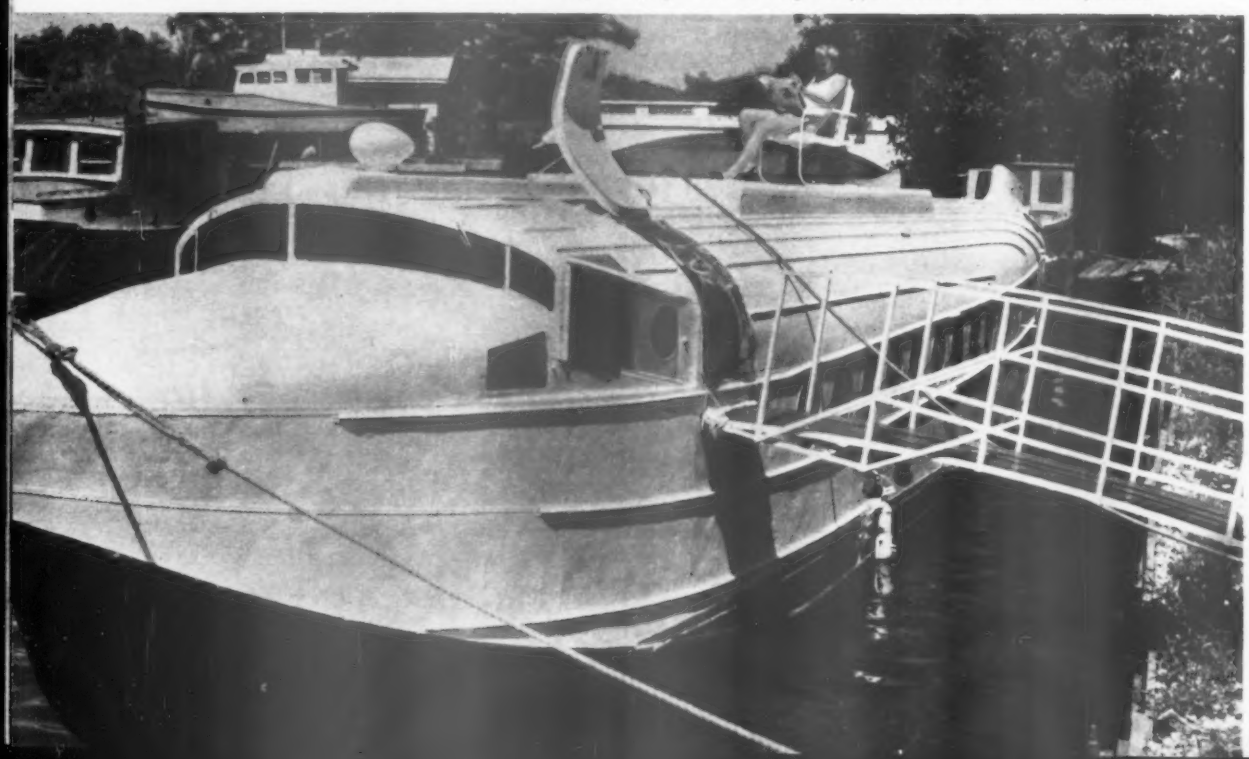
Kitchen converted from galley (left) is compact and handy because of original need to design carefully. Bedrooms use Pullman-type berths (right). With minimum modification, the 70-foot hull is made into an efficient home.

Home IN A Clipper

By E. W. SUDLOW

LEMUEL L. STEWART has a wife, three sons and a daughter, and he had been fighting the housing shortage in Miami, Fla., for some time when he heard that Pan American Airways was selling its obsolete Sikorsky flying boats. Stewart investigated and bought one for $750. He towed the big boat by Jeep from Biscayne Bay to a lot on a canal site several miles away. Wings and tail were removed and the 70-foot hull was caulked and painted. Inside cabins were partitioned off, a solar water heater was installed, an electrically-equipped galley enlarged, and the front compartment, which had been the cockpit, was made into a solarium. Pullman-type berths were used in the bedrooms. Airfoam divans, chairs and leather accessories were reconverted from *Clipper* equipment. Stewart estimates that his new home cost him $3,000 in all. Later he will use it as a fishing lodge. END

Hull had to be caulked and painted, and its exterior will require much more care than a house. On the other hand, it is probably much more carefully constructed than a house. In original flying boat, the wing was pylon-mounted and externally-braced.



THE FEAST WAS OVER THE MOUNTAIN

Sourdough cakes and venison make man-sized breakfast for Idaho pilots.

Idaho breakfast flyers must cross rugged mountains. Yet there have been no accidents in two years of state breakfast flights.

Sourdough cakes are western recipe. Batter is soured first with yeast, aged, remixed night before use with new flour and soda.

Youngest pilot on Idaho breakfast flights is eight-year-old Gary Lynn Barr, son of Idaho Falls operator. Gary has 40 hours of dual in Ercoupe.

(Continued on next page)

THE FEAST WAS OVER THE MOUNTAIN

continued

Park headquarters of Craters of the Moon National Monument is below flyers. The park is a rugged area of lava and cinders.

Thalman Special was hottest performer among planes to attend flights. In background is Mount McCaleb of Lost River Range.

Ghost town of White Knob was once one of richest copper mining camps in world. A few lessees still work the mine at left.

Challis is picturesque western town with frame buildings and false front stores. It is in Round Valley near the Salmon River.

By BOB ARENTZ

ONCE A MONTH, except in winter, Idaho breakfast flyers commune for a morning feast that is a joy to behold and to eat. Last October 12, about 140 planes from all parts of the state gathered in the picturesque little town of Challis (pop. 300) for one of these wonderful breakfasts. They were guests of the town which turned out en masse to serve them 337 pounds of the choicest venison from nine deer, plus hotcakes made from 54 gallons of sourdough batter, sweetened with 20 gallons of syrup from chokecherries which grow wild in the mountains. The coffee was made in washtubs over a pine wood fire, and while the pilots feasted, a bearded mountain host roved about urging them to return to the counters and "make out a meal." I have attended 15 of these flights in the past two years and the plane attendance has averaged at least 100. Idaho is such a big state that the average pilot flies six hours to attend. It costs about $500 to sponsor a breakfast, which often comes to more than $1 per citizen, yet 1948 dates have already been filled. It is a beautiful tribute to the gospel of the full belly and the second helping. END

Venison for breakfast is high point of Challis flight which drew more visitors than there are residents in the little frontier town. Northwest tip of Pahsimeroi Mountains and Little Lost River Range are in background of top picture. Lower photos, left to right, show venison broiling over charcoal, part of 20 gallons of syrup from chokecherries gathered by Challis women, and washtub coffee pot.

Visitors (l. to r.) include Bill Hanmer, Salmon postmaster; Sportsman Max Oyler, Writer Keith Barrette.

Chet Moulton, Idaho aeronautics head, made flights a big success.

Bill Woods (center), pilot with nearly 20,000 hours, flew tri-motored Stinson.

Old Travel Air is typical of planes many mountain pilots prefer. They land and take off shorter at altitude than most modern craft.

First Cessna 195 on an Idaho breakfast flight was flown in by Frank Medlin, General Aircraft, Boise. In background is Boeing 247 airliner.

Undersea rocks are searched for oil by plane dragging Magnetic Airborne Detector, which records magnetic field of underlying strata. Plane is guided by Shoran stations on anchored ships. It flies circular course around "drift" station (left) and records position by reference to "rate" station (at right).

The MAD Prospectors

Magnetic Airborne Detectors hauled by Shoran-guided planes search for petroleum.

By WILLIAM WELSH

THE airplane, and some of its war-developed accessories, have been recruited to survey vast areas of the earth in a hunt for oil. If preliminary results are indicative, the work of the airborne magnetometer guided by a war-developed electronic navigation device, will turn up new sources of petroleum where conventional search methods are impracticable or prohibitively expensive.

The airborne magnetometer or Magnetic Airborne Detector was used by Navy pilots to search down enemy submarines during the war. Now it has been converted to peacetime use by the International Aero Service Corporation of Philadelphia. Homer Jensen, who contributed to the planning and execution of the initial airborne magnetometer geophysical surveys when they were conducted while he was in the Navy, is in charge of aerial operations for the company.

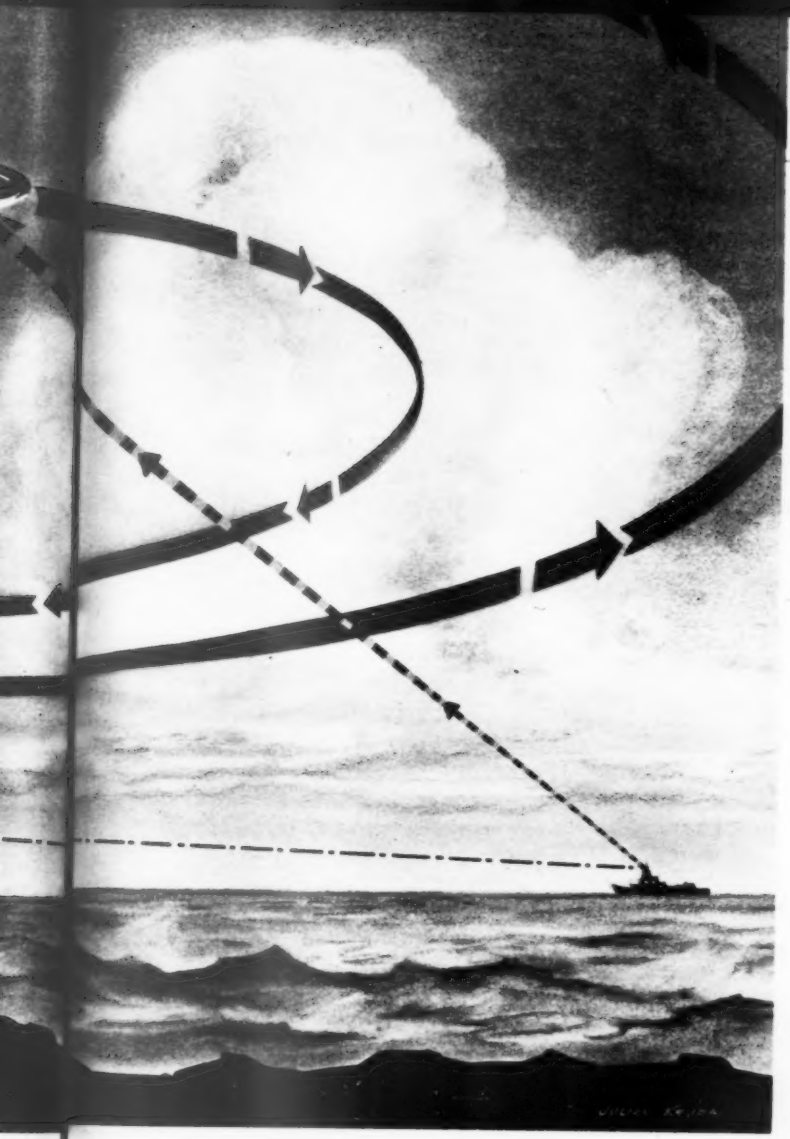
Guided by Shoran or a split-field camera, depending on whether the search is over water or over land, the survey plane covers an area in which the geophysicists believe oil may be buried. The magnetometer makes a running record of the magnetic field of the area over which it is borne.

The magnetic field of any area depends on the minerals under the surface, hence the recordings are a good indication of mineral deposits there. An analysis of the magnetometer records by trained geophysicists will disclose whether it would be profitable to drill for oil.

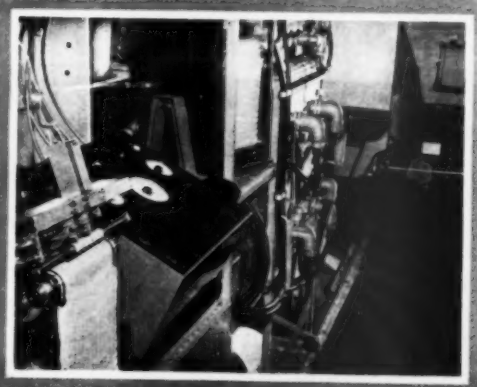
The first extensive survey with the MAD, which is the Navy's abbreviation for the device, was made in Iron County, Mich., at the direction of the Naval Ordnance Laboratories and the Geophysical Survey.

Early usage of the magnetometer had shown engineers that high accuracy was necessary in the control and record of the plane's flight. Though the flight guidance need not be letter-perfect if the variance is known, the flight record had to be continuous and correlate perfectly with the readings of the magnetometer.

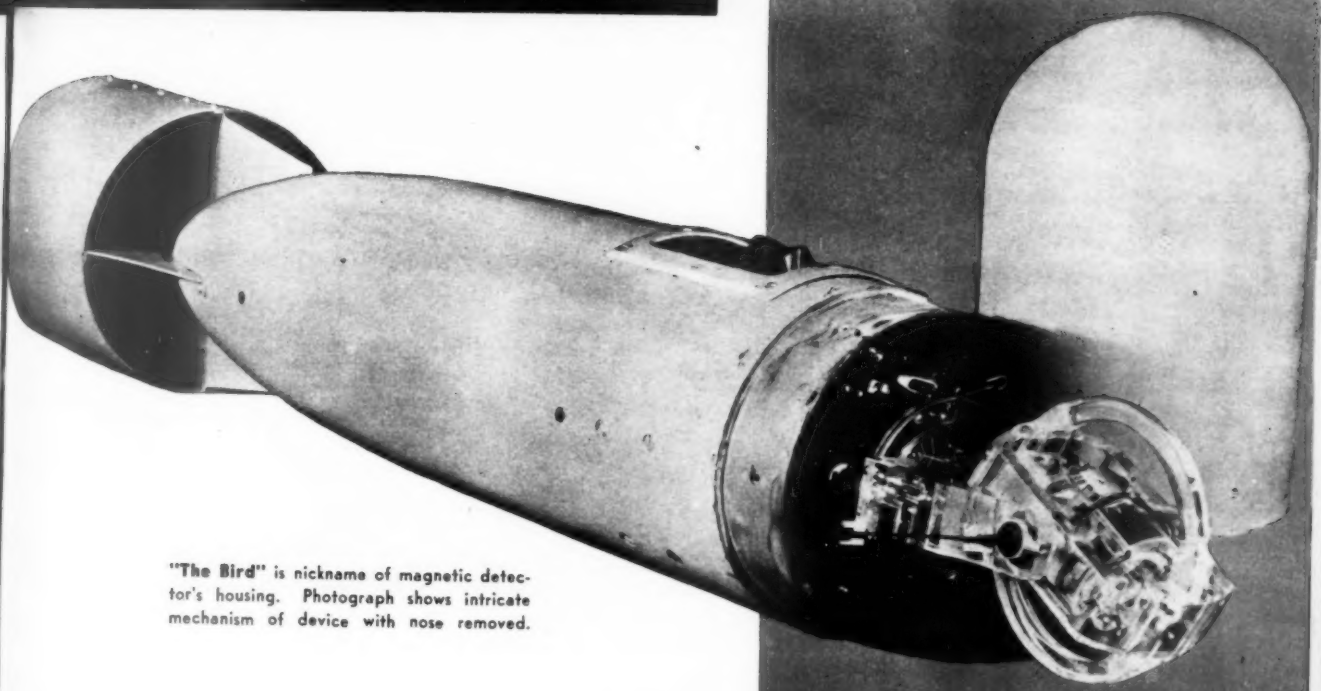
The MAD takes a magnetic reading of the area. Such reading will vary with altitude, so the lowest possible flight level is necessary. Because (*Continued on page 72*)



Fitted with magnetometer, Geological Survey plane is making nation-wide magnetic studies.



Instruments for magnetometer include strip camera, recording radio altimeter, recorders.



"The Bird" is nickname of magnetic detector's housing. Photograph shows intricate mechanism of device with nose removed.

Typical "brass hat" crew includes (from left) Navigator B. B. McKinney, Jr.; Pilots N. M. Green and O. V. Harkness, Radioman R. E. Martin, Steward Bobby B. Haynes, Flight Engineer Marino Greco.

Ready for take-off, crew goes down check list. Pilot Harkness listens as Flight Engineer Greco confers with Co-Pilot Green (right). Later, hot coffee is served by Sgt. Haynes, the steward.

Getting flight clearance. Lieutenant Green and Capt. Harkness obtain okay from Capt. Chas. M. Mills (left), the chief pilot. Mills computes the plane's loading data on weight and balance device.

THE Brass-Hat Squadron

By C. BUDD DUGAN

ATC special mission fleet flies diplomats to all parts of world.

THEY DON'T SALUTE in the Brass Hat Squadron—they just rap on the nearest hunk of wood and brag, ". . . we ain't had an accident yet!" From commanding officer to the lowest file clerk these 300-odd men are proud of their astounding five-year safety record which has been maintained while carrying the world's most important Governmental officials to all sections of the globe.

These men seldom get their names in the paper. If you asked them their duties they'd just say that they're assigned to the Air Transport Command's Special Mission Fleet operating out of the Washington National Airport. But the records show that these are the fellows who man and fly the seven big Douglas *Skymasters* which haul big-name delegates to meetings and posts around the world. Senate and House committees use their planes for jaunts which affect future U.S. policy.

But to the Brass Hatters, Madame Chiang Kai-shek, ex-President Hoover, Secretary of State Marshall or ex-Secretary Byrnes are just "good guys" who ride back there in the passenger compartments. All M/Sgt. Marino Greco remembers of the Yalta Conference is that he came back to the U. S. $942 richer from wise investments in a crap game.

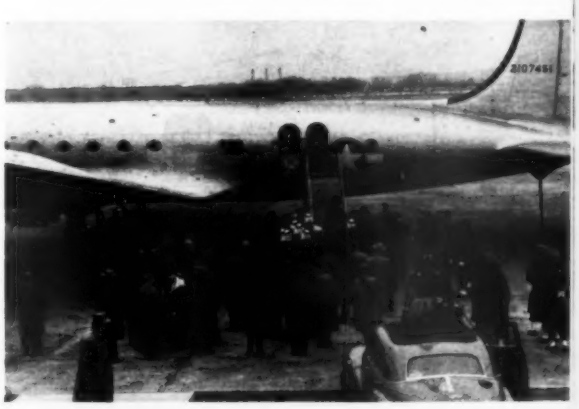
You talk with Navigator 1st Lieut. Einer Christensen and he'll offer you a cigarette bought the day before in Borinquen, Puerto Rico. He doesn't think there's anything strange about that. He just needed cigarettes yesterday.

This post-war Air Force squadron lacks the casual air found in most peacetime groups. Everybody is as "eager" as if he were assigned to a fighter group operating along a "hot" combat front. Not one of them wants to request a change of station even though flight duty with the Brass Hats means that he'll be out of the country six months each year. He looks down on the other Air Transport Command pilots who fly the regularly-scheduled runs. "Those guys don't have any fun," says Brass Hat Chief Pilot Charles M. Mills. "They're just as bad off as an airline pilot who flies back and forth between the same two cities. It's too routine. Now us, it's different."

Odds are that a Brass Hat crew will never duplicate a flight. Lieutenant Christensen, however, re- (*Continued on page* 50)

Round-the-world course is plotted by Lieutenant McKinney, a navigator, with the aid of T/Sgt. James Munson.

Returning dignitaries leave ATC plane. Sen. Owen Brewster, chairman of the War Investigating Committee, at left.



Visiting Arabian royalty, Crown Prince Ibn' Saud (center below) boards the old Presidential C-54 for a flight to London. This plane has been superseded now by a DC-6.

On location, helicopter hovers low (left) to film a scene from RKO's "Your Red Wagon," showing escaped convicts fleeing down a road. Camera mounted on right of door (above) is balanced by box of buckshot and sand extended on opposite side. Cameraman signals pilot by hand to direct movement of aircraft.

Helicamera

The gunfight in that new horse opera may have been filmed by a helicopter-borne cameraman.

HELICOPTERS have now been put to use by the motion picture industry in the unorthodox capacity of flying camera mounts.

Far from being a novelty, the use of helicopters from which to film motion pictures is giving the producers a creative effect that heretofore has been impossible—and in some scenes is saving them as much as 5,000 per cent in shooting costs.

Only one specially-rigged Bell Model 47-B craft, owned by Armstrong-Flint Helicopter Company, Los Angeles, has been used thus far, but first cinematography results have been so attractive to film executives that a fleet of "'copter-cameras" is foreseen for mid-1948.

Some of the uses to which the new device can be put is to film running chases, big battle scenes, men scaling cliffs, speedboat and yacht races, and other outdoor scenes which are best made from elevations.

And that is exactly what the helicopter has been used for—an elevator, or crane, for a motion picture camera, one that can be moved forward at a speed of nearly 100 m.p.h., can hover, and can move either sideways or backwards.

Only a 'copter-camera could have filmed the following scenes, soon to be seen in "Your Red Wagon," an RKO-Radio picture:

Three escaped convicts are hiding in brush halfway up a hill. They walk across an open field toward a billboard at a highway intersection. One sprains an ankle. After a short debate, the trio decide the injured man will stay hidden behind the sign while the other two continue to their hideaway.

At the start of the scene the helicopter hovers about 10 feet over the trio. On their way across the field they are paced from about 20 feet up. Then in front of the billboard, the helicopter zooms in for closeups and holds them until the two men cut across the road and into another field. Here the craft does a reverse zoom to 50 feet, giving the cameraman a panorama view of the entire setting. It is filmed in one continuous strip.

"Without the helicopter," said John Houseman, producer of the film, "this scene would have been almost impossible. But if we did try to do it it would have cost us upwards of $10,000 and taken several days. This way we got three takes in half an hour. Cost of the craft for the entire day was only $500."

(*Continued on page* 70)

Camera in helicopter flying over set is one of two that are trained on an important scene during the filming of a Warner Brothers' movie, "Johnny Belinda." Other camera is located on scaffolding to the right.

Camera and mount fit securely on the side of Bell Model 47-B helicopter. The cameraman, veteran Paul Ivano, worked with Knute Flint, a pilot whose company pioneered 'copter-camera motion picture work.

Practice stalls are included in flight test. But do they really tell the instructor anything?

Good judgment is crucial in flying — but no one knows how to test it.

ARE FLIGHT TESTS USELESS?

By KURT RAND

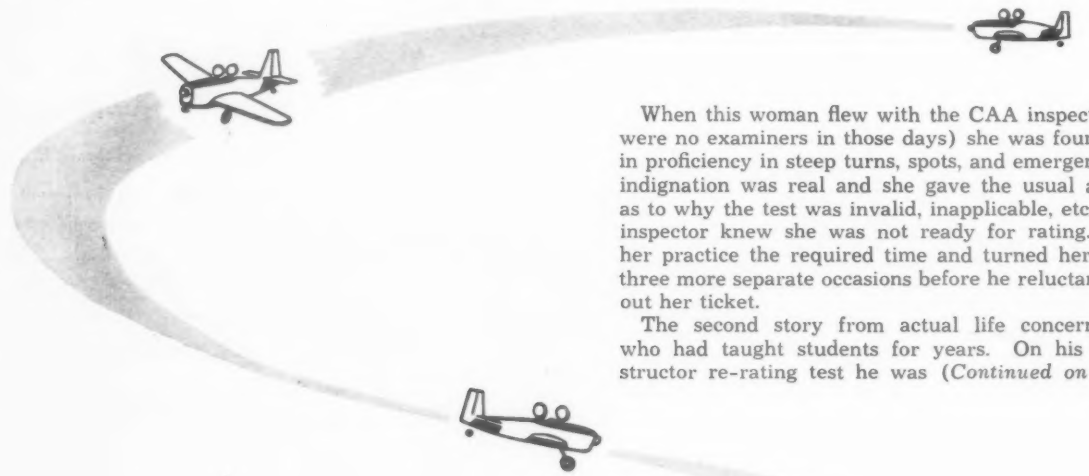
DOES a flight test really *test*?

Suppose you are ready for your private pilot examination and go before an examiner for a flight test. You fly for an hour, run through several silly maneuvers that you'll never do again, such as spins and pylons, come down and find that you have failed. Yet in your mind you feel perfectly competent to fly and carry non-revenue passengers.

What did the flight test prove? What right did that examiner have to fail you? Is any one man competent to judge another pilot's flying ability?

Those questions and many others flicker through your mind as you resentfully receive your Form 666. Now several hours of practice are required before you can be tested again and you will have to become more proficient in the same idiotic maneuvers you failed in but which you may never use again.

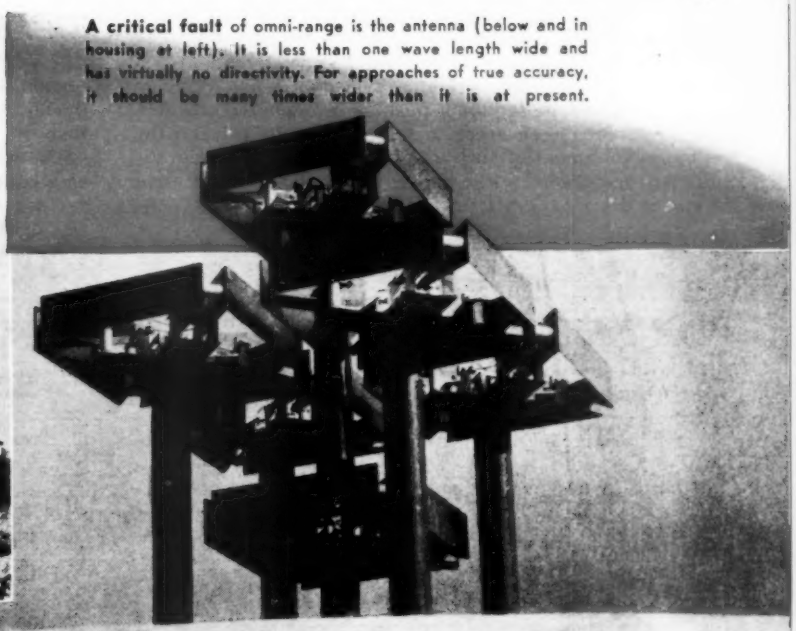
Let's take some actual examples from real life. These are true stories, typical instances of flight tests and what they prove or don't prove. The first story concerns an elderly woman who owned her own airplane and who had practiced for many hours to pass her flight test.



When this woman flew with the CAA inspector (there were no examiners in those days) she was found lacking in proficiency in steep turns, spots, and emergencies. Her indignation was real and she gave the usual arguments as to why the test was invalid, inapplicable, etc. But the inspector knew she was not ready for rating. He had her practice the required time and turned her down on three more separate occasions before he reluctantly wrote out her ticket.

The second story from actual life concerns a man who had taught students for years. On his flight instructor re-rating test he was (*Continued on page* 76)

Gliding turns are included in flight tests given by CAA examiners. In theory they tell them whether student can fly with precision. Author asks if this isn't just another meaningless exercise which student probably will never use again?



A critical fault of omni-range is the antenna (below and in housing at left). It is less than one wave length wide and has virtually no directivity. For approaches of true accuracy, it should be many times wider than it is at present.

WHAT'S WRONG WITH Omni-Range?

CAA's new radio range system is not accurate because it violates a basic law of physics.

THE Civil Aeronautics Administration is proposing to spend more than $27,000,000 to install omni-directional range stations at 465 locations on the nation's airways. They would thereafter be maintained at an annual cost of over $9,000,000 per year. Once installed, this complex system of high frequency radio ranges presumably would provide airway guidance in all directions. A pilot would merely select a course, set it on an instrument, and fly the course by watching a vertical needle veer from right to left to indicate variation from his preset course.

There are three things wrong with this elaborate and expensive project:

1. The equipment is too expensive and complex to be practicable for personal airplanes. It would therefore be limited to the fewer than 1,000 commercial airliners using the airways, and to a few executive craft. Yet personal airplanes which would not be served outnumber the airliners which would by more than 100 to one.

2. It isn't nearly as accurate as its sponsors claim.

3. It is basically an old-fashioned and obsolete system which violates a fundamental law of physics.

There can be no argument about the need for more accurate radio or radar navigation systems. When a private pilot or an airline captain is pushing through foul weather, on instruments, he needs to know where he is. But the first requirement of such a system is that it be accurate. It is worse than useless if it is flagrantly prone to error and violates basic physical laws!

FLYING editors have recently gathered these facts from prominent engineers, scientists and electronics experts, some of whom are internationally known. These men agreed unanimously that the omni-range system, often referred to as ODR but more recently as VOR (visual omni-directional range), runs afoul of a basic principle of physics. It is made to operate with lesser degrees of error by some ingenious technical developments—"radio tricks"—which have been incorporated. These gadgets can alleviate but they cannot cure the basic errors in VOR.

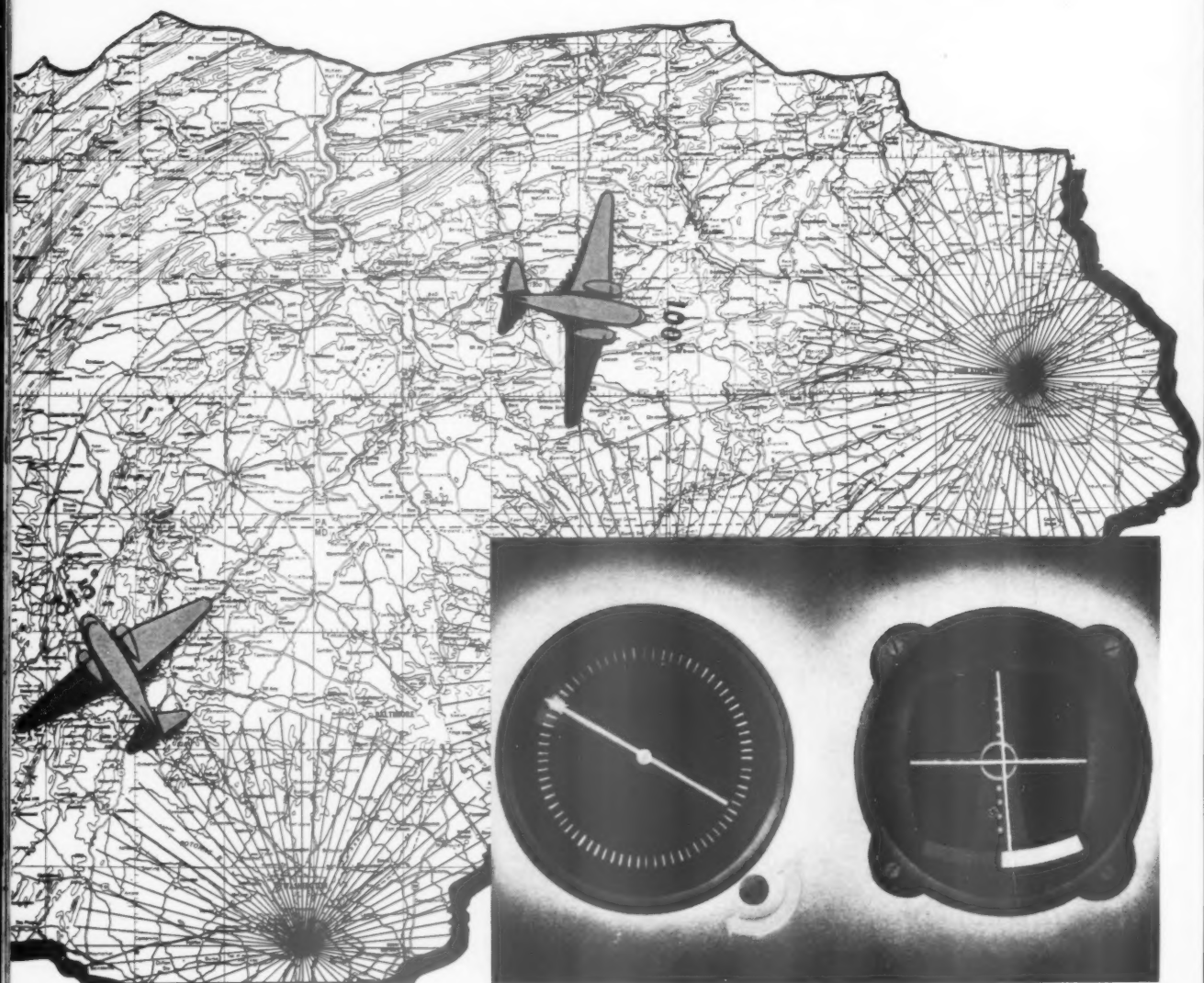
VOR is designed to show the pilot of a specially-equipped airplane his bearing in relation to true north when he is in the range of the radio beam sent out by the VOR revolving antenna. The word "omni-directional" is derived from the fact that it is supposed to give flyable courses at all angles from the range station rather than the four presently available with the "A-N" ranges.

The system is flown by reference to the vertical needle of a cockpit instrument—the same instrument developed for use with CAA's low approach system (ILS). The cross pointer of the instrument is not used in flying VOR, however. The pilot determines the compass heading he must fly to bring him over the range station. He sets that course on a second instrument—a special azimuth selector dial. As the pilot flies his selected compass course, the vertical needle of the first instrument indicates "on course," moving to left or right as the plane deviates.

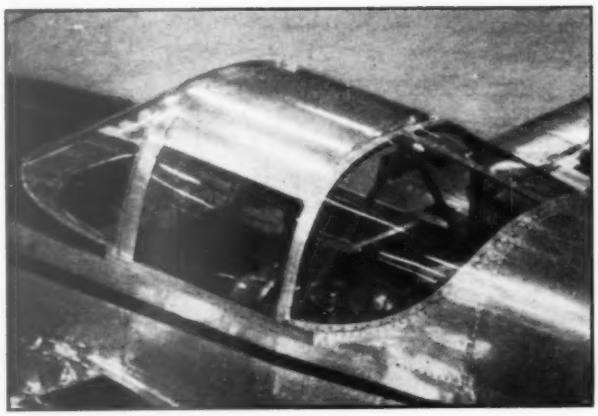
This sounds beautiful in theory, but as already pointed out it doesn't just exactly work out in practice. Even the CAA comes close to admitting as much in its printed report, "Advancing Air Navigation," which states:

". . . There is a tolerance on (*Continued on page* 80)

Planes flying omni-ranges theoretically could fly any course by tuning in azimuth selector (inset, left) and watching vertical needle (inset, right) for deviation to right or left. In practice, however, there are only 18 safe courses on a range.



THE *Temco Swift*



The new look comes to Temco's Swift. Paint job and striping have been redesigned (above). Overhead metal hatch (inset at left) is hinged at front and opens up and forward.

FLYING's CHECK PILOT

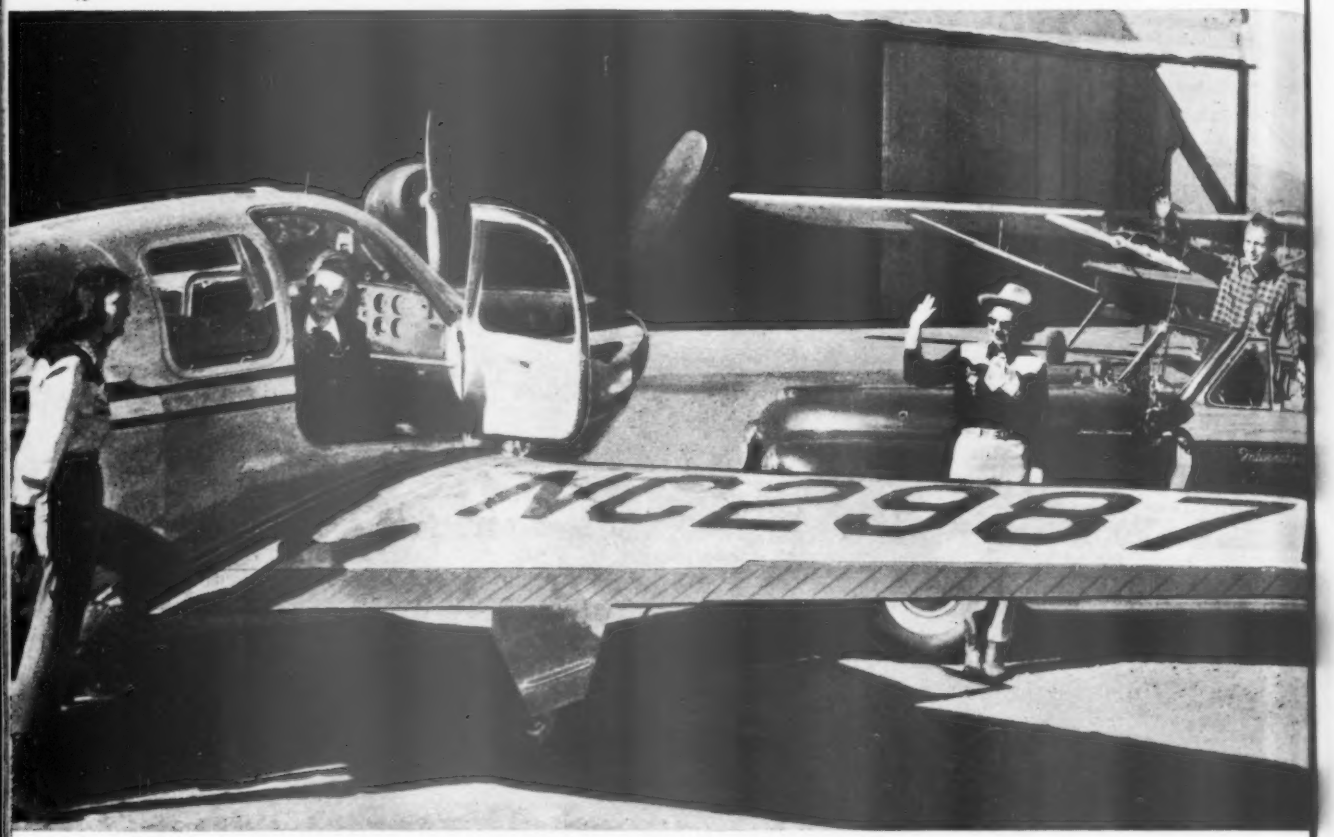
EDITOR'S NOTE

This series of articles is planned to help the pilot and prospective plane owner evaluate aircraft now on the market. Only aircraft holding a CAA Approved Type Certificate are flown. The author is not a professional test pilot. He evaluates each aircraft through the eyes of an average private pilot who flies an airplane either for business or sport.

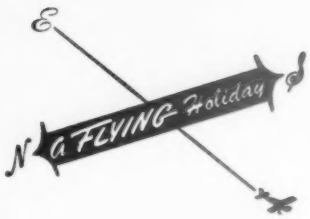
JUST mention the name *Swift* to the average private pilot and he's liable to flinch and get a knowing look on his face. Press him a bit and he'll tell you the *Swift* is the trickiest, hottest plane in the business. By the time you have heard him—and dozens of others like him—give the "inside dope" on the *Swift*, you'll probably hesitate to even taxi slowly in one.

Which just goes to prove how far into the world of fantasy such airport gossip can go, with little relation to the facts. Such gossip, however, does leave a lasting impression; frankly, it did on me. I was not particularly thrilled at the prospect of flying this airplane—despite the fact that I had flown several *Swifts* back in March and July, 1946, and had come home unscratched.

Truth of the matter is that the *Swift* got its bad reputation from the under-powered 85-h.p. model first produced by Globe. That airplane had several basic faults, most of which I described in my article on that airplane in FLYING's July, 1946, issue. It had too much flap (40°), which made it easy for inexperienced pilots to get into trouble on approaches. It had a full-swivelling tail wheel, which helped make it one of the ground-loopingest airplanes ever. Its wing loading was high for an 85-h.p. airplane. And many of the 85-h.p. *Swifts* were equipped with the man- (*Continued on page* 66)



Flyers are welcomed at Nogales by airport manager and friends in station wagon. Limousine to town (eight miles southwest) is 80 cents per person.



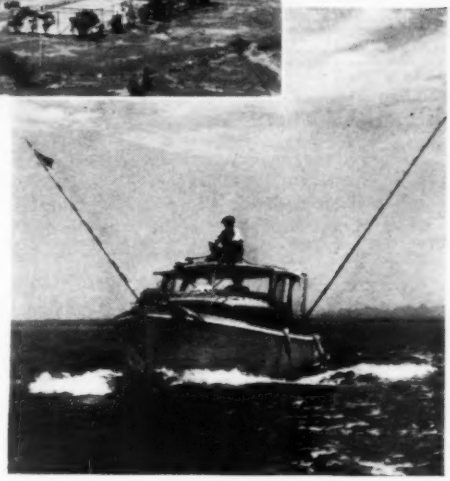
Nogales: ARIZONA'S BORDERLAND

Old Mexico and the rugged west meet at historic Arizona town.

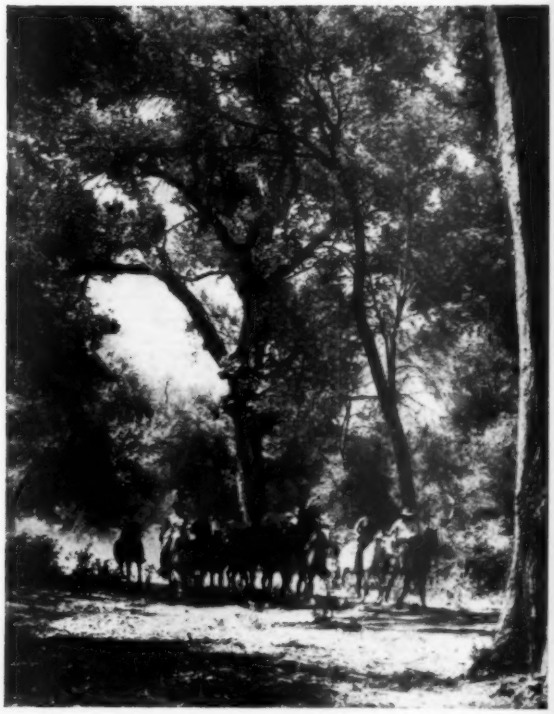
International airport at Nogales is port of entry, has two runways, including one 6,200-ft. paved strip. Minor aircraft and engine service and repair are available here.

DOWN on the border between Arizona and Sonora, Mexico, a city of 43,000 persons has captured the fancy of southwestern aviation enthusiasts. It is Nogales, lying partly in the States, partly in Old Mexico. The war gave the city an excellent airport which, through a combination of location and aggressive management, has put the city and surrounding area prominently on the aviation map.

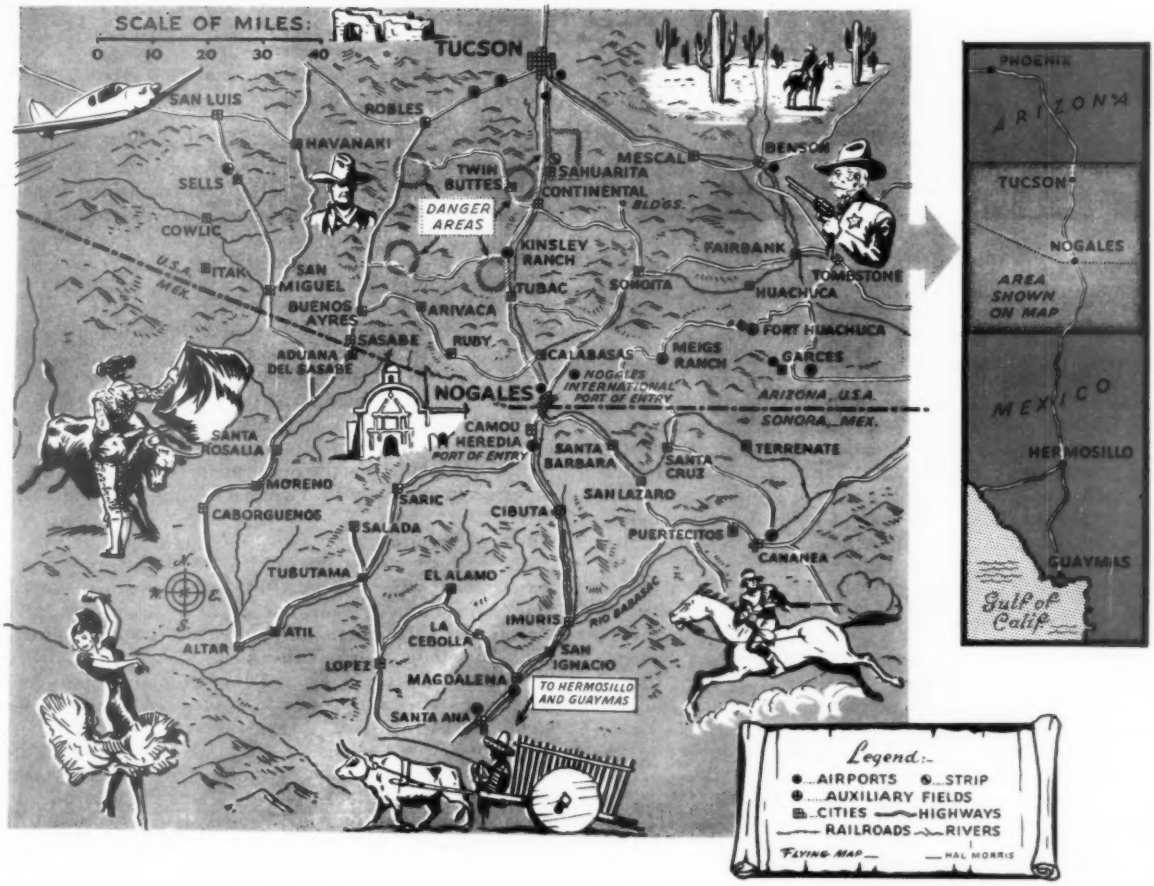
On the Arizona side the thriving American city's modern culture is reflected in the airport, the schools, churches, homes and shops—but at the same time the atmosphere of the Old West is retained. Through a gate citizens of both countries pass freely every day. Burros laden with wood tread the streets, adobe houses cling to steep hills, and native shops display curios. Nogales is 50 miles south of Tucson, on the new Skyway One. For the east-west traveler it offers, for the price of a short detour, a chance to see Mexico without the slightest border delay or expense. For the southbound vacationist it is a destination in itself, a (*Continued on page* 78)



Fishing mecca in Mexico is port of Guaymas, located 240 miles south of Nogales. Hotel Playa de Cortes (above) has daily rate of $12.50. Deep sea boats can be chartered for $40.



Dude ranches near Nogales have modern facilities, but retain flavor of old west. Meigs Ranch has a landing strip.



REPORT FROM WASHINGTON

Channel wing airplane developed by Willard R. Custer is early version of craft. New model is expected to take to the air soon.

By FRED HAMLIN

RUMORS that CAA Administrator T. P. Wright is going to resign are false—at least as this goes to press. "He has no intention of resigning," is the word from a number of the best Civil Aeronautics Administration sources. Mr. Wright has at times been disconcerted, to put it mildly, at the way the industry swings on CAA and its leadership. He also is not unaware that the $10,000 a year he gets in salary is not up to some of the fees he has earned in private industry. But at last accounting he is staying on, both from determination to see the job through and at the urging of the White House.

Landis

Whether Chairman James M. Landis will still be at the head of the Civil Aeronautics Board by the time this gets into print is anybody's guess. Landis was appointed to fill out the term of Welch Pogue, who resigned, and the Pogue term was good only until January 1, 1948. Betting has been that the President, aware of Landis' connection with the New Deal and partial toward its remaining survivors, would put him up again for a six-year stretch and that the appointment would be confirmed on the Hill quickly. Betting was equally fifty-fifty that pressure from the industry, where Landis is not, in places, regarded with affection, would end his regime. Who might succeed him is something else again. About the only sure thing: nobody else on the Board would seek the job or desires its taxing routine. Probable outcome is that the guessing game will be continued well into '48, the President keeping Landis around on an interim basis until he can make up his mind what to do permanently.

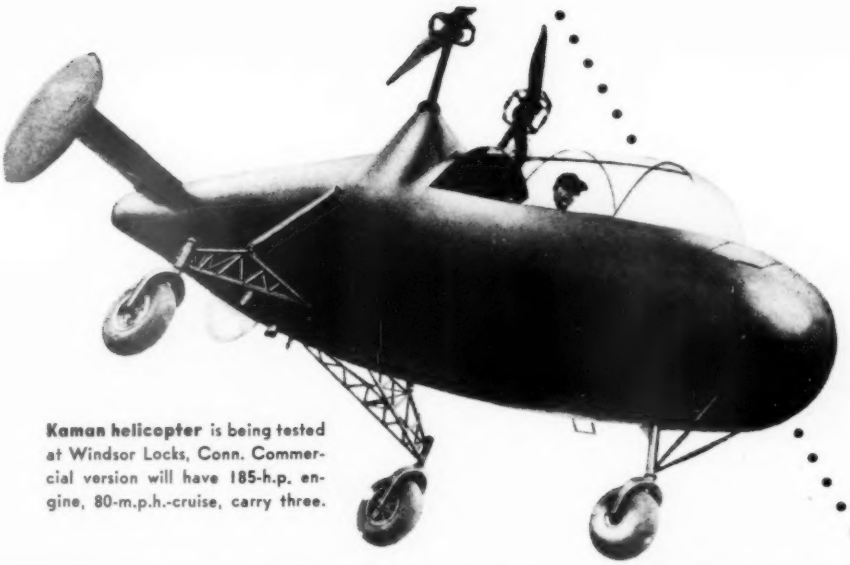
Budget

Both Landis and Wright, not to mention most staff members at CAA-CAB, are already suffering from the annual New Year Government headache—appropriations. Each outfit is asking for more money than it got last year, and both face an economy-minded Congress. Our best information is that CAA wants about $150,000,000 as compared with $119,000,000 last year. The 150 million figure has already been pared by the Bureau of the Budget, although what they do is supposed to be a state secret. Further whittling may be expected from Congress.

Wright & Co. base their request for a raise on an $8,000,000 jump in airport construction and greatly increased costs for air navigation facilities. The Board wants to go from its modest (for a Government bureau) $3,000,000 of last year to $3,600,000. The extra half million or so will be used in an attempt to catch up with safety enforcement proceedings, which nearly trebled during 1947, partly, says the Board, because Army-trained pilots have shown genius for violating the rules when they get into a lightplane, partly because there has been a huge increase in pilots, with a parallel jump in violations.

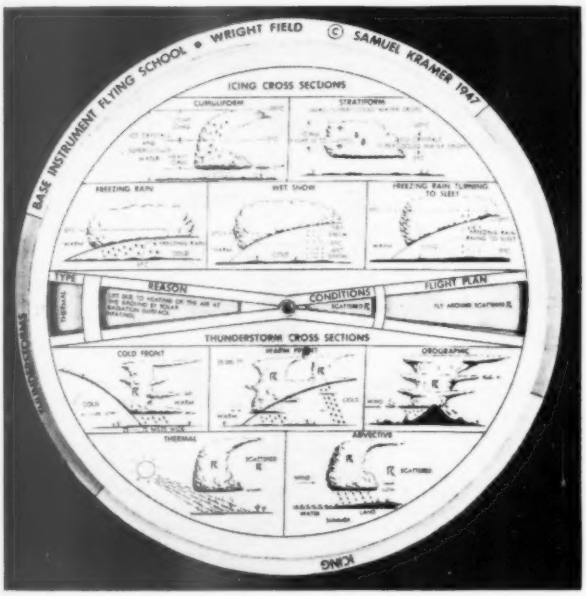
Channel Wingding

The long-postponed flight of Willard R. Custer's post-war channel wing airplane (FLYING, September, 1947) is now scheduled for "early this year," according to Mr. Custer and his backers. They explain the delays (originally they hoped to get the plane airborne "before the snow flies" last year) by praising the plane. Still confident of its ability to land on a dime and climb like an elevator, they held off public flight till they could iron out all possible technical bugs, according to Mr. Custer. The plane has been a-testing in a Washington (D.C.) wind tunnel since late fall and "is two jumps ahead of what we expected of it." When it is ready for its first flight, Custer promises, everybody and his grandmother is going to be invited to Hagers- (*Continued on page* 74)



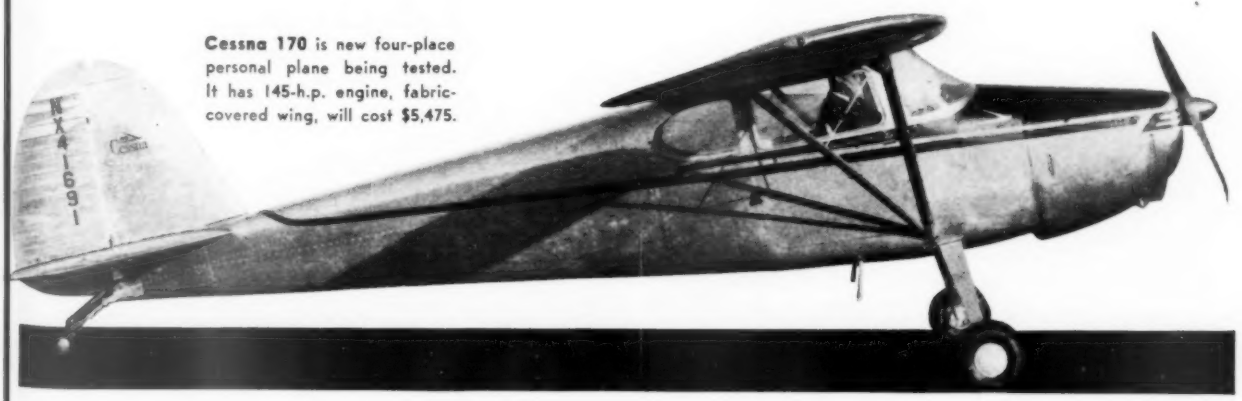
Kaman helicopter is being tested at Windsor Locks, Conn. Commercial version will have 185-h.p. engine, 80-m.p.h.-cruise, carry three.

HAVE YOU SEEN?



Weather dial, developed by Stanley Kramer, Air Force instructor, shows thunderstorms and icing, tells pilots what to do.

Screwball ace is "Col. Charlemagne Bilgefilter" who does aerial comedy act with the last Fairchild KR-31A, which is 20 years old.



Cessna 170 is new four-place personal plane being tested. It has 145-h.p. engine, fabric-covered wing, will cost $5,475.

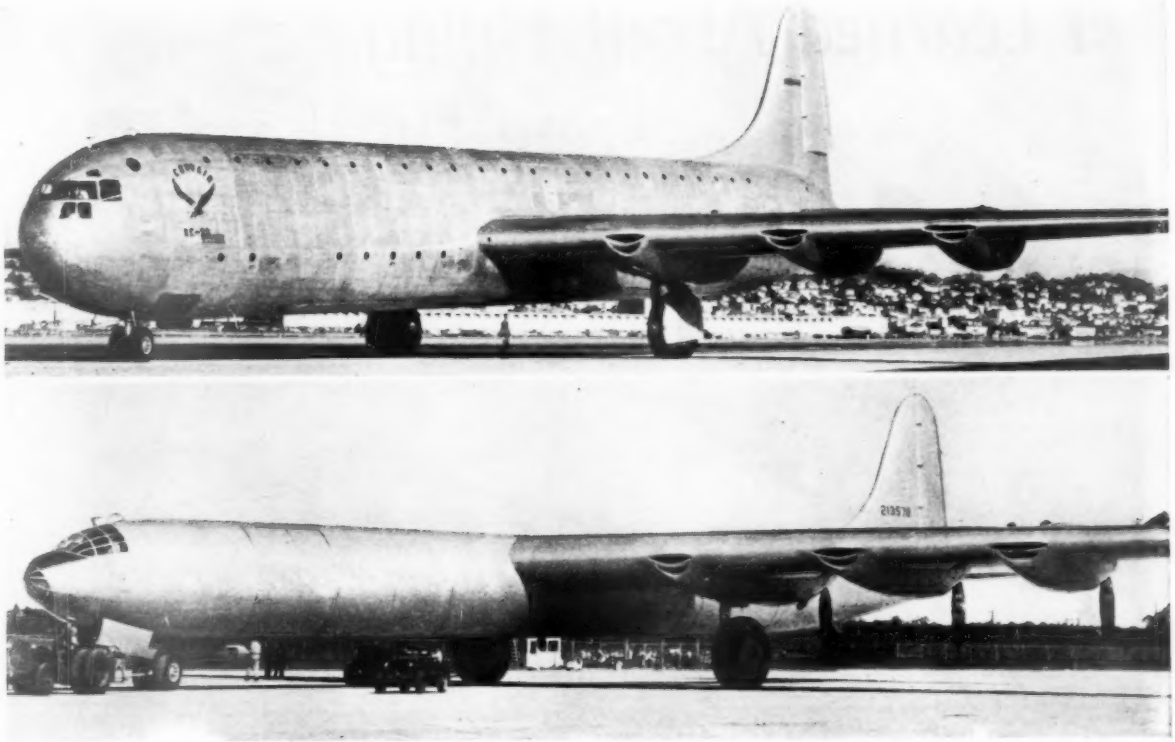
Flying-wing glider captured from Germans has been given to Northrop company for testing. Span is 78 feet, weight 750 pounds.

Electronic autopilot, developed by General Electric, has tiny finger-tip control unit, is being tested for Navy and Air Force.

HAVE YOU SEEN?

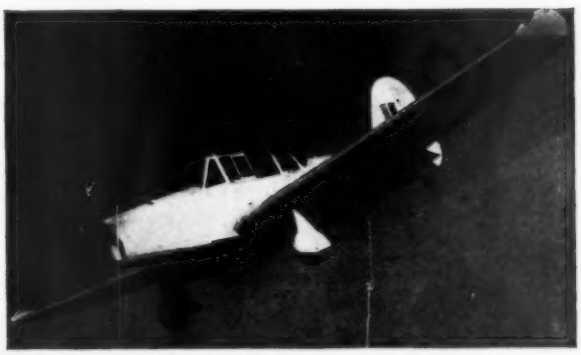
continued

North American XP-86 (top photo), new Air Force jet fighter, is super-speed version of Navy FJ-1 (lower photo). Sweptback surfaces reduce compressibility effect. Speed is over 600 m.p.h.



Convair XC-99 (top) is new transport version of Air Force's giant XB-36 bomber (lower photo). XC-99 has six 3,000-h.p. pusher engines, can carry 400 troops and 19,000 gallons of gas. Gross weight, 130 tons.

Five-engined Lancaster actually is test unit for new British turbo-prop engine in the plane's nose. Nose engine upped plane's speed 30 m.p.h.



All-weather trainer for RAF, Percival Prentice, has 250-h.p. engine, blind-flying and low-approach equipment. Speed: 155 m.p.h.

Northrop Pioneer made this two-engined landing during recent tests fully loaded. Ship also takes off and climbs with engine cut.

I Learned About Flying From That! NO. 99

Lieutenant Ward was caught without lights one black night over the Mojave Desert—and he didn't know the layout of his glider's cockpit.

By
ROBERT N. WARD

This pilot almost crashed after neglecting simple cockpit drill.

SO YOU'RE a pretty good pilot, eh? How long since you've gone through cockpit drill in a *Grasshopper,* brother?

Sounds a little silly to you, does it? Cockpit drill is for the big ships, you say—the transports and the fighters and the bombers. The babies with a mile-long check list and a barrelful of instruments and dials and levers around the pilot. Why, a lightplane's too *simple* to need cockpit drill.

Don't you believe it, mister. There are times when it can be supremely important to know the inside of the most elementary cockpit. I learned it the hard way, at 2,500 feet, at night, with another aircraft practically riding piggy back on my own.

This all happened one dark midnight over the dry lake airport at Twenty Nine Palms, Calif., where a class of Army glider pilots—including this one—was getting its first concentrated taste of night flying.

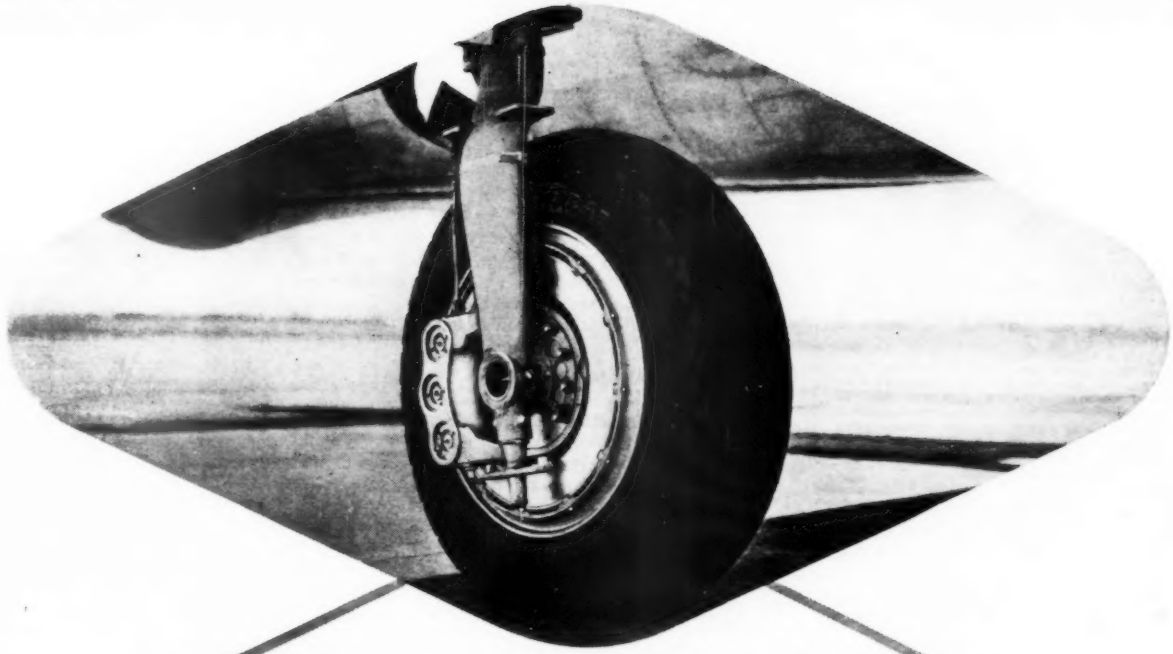
Looking down at the Mojave Desert on a moonless night is a lot like gazing at the underside of a sooty frying pan. There simply are no lights on the ground by which to orient yourself. This bothered us a little at first, but after five hours or so we were soloed night "veterans" in the motorless ships. And with cockiness came carelessness.

For our night work we were using Schweizer TG-2s, mid-wing, two-place soaring gliders with a 53-foot span and fairly high performance and glide ratio. Most flights were double tow, with two gliders hitched behind one tug plane by a rope "V".

We dispatched tows every few minutes. A tug would haul its gliders out a fixed distance, return, and circle in an assigned air space at a given altitude near the field. When the tug pilot got a green light from the "biscuit gun" at ground control he would fly directly over the field and both gliders would peel off and land.

One day all Schweizers at the field were grounded for maintenance. That night at the flight line we found ourselves switched to Taylorcraft TG-6s, regular lightplane airframes converted to gliders. I had been flying the TG-6s in the daytime two weeks or more, and consequently my instructor sent me up alone this particular night.

These ships had no cockpit illumination but I knew where the navigation light switch was. Not paying too much attention to what I was doing, I worked the switch in and out until I could see reflections on the ground from the wingtip lamps. There was no reflection from the tail light, but a ground crew man trotted astern and assured me it, too, was functioning. (*Continued on page* 75)



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AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is: "To make flying more useful, less expensive, safer and more fun." Headquarters are: 15th and New York Aves., Washington 5, D. C. Members also receive a special AOPA edition of FLYING, news-letters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

RECENT aircraft accident analyses show that a large percentage of head injuries and their resulting fatalities can be prevented by use of effective shoulder harness.

Crash injury research officials, studying accidents involving 596 persons, reported 483 suffered head injuries (fatal and serious). Safety belts failed in 149 cases and held in 437. In 164 cases, although the safety belt held, it did not check the velocity of the head enough to prevent its striking forward structures. In 187 cases, where velocities were smaller or where the impact was moderated by the head striking "soft" metallic structures, contusions, lacerations and other head injuries occurred.

To determine the most frequent types of critical injuries crash injury research investigators examined 85 critically injured persons. There were 59 cases of critical head injuries without any other normally dangerous injury to the body, as compared with 18 cases of head injury with other serious body injury. Only eight cases were reported where there was no serious head injury.

AOPA, co-sponsor of the Crash Injury Research Project, favors installation of shoulder harness in all private aircraft. However, in the absence of manufacturer's cooperation, the association is encouraging pilots to install their own shoulder harness.

Pictured is such an installation designed by Clement Pease, AOPA member of Boston, Mass. Consisting of regular safety belts, the harness is anchored to a moly tube running across the rear of the seat. The tube is fastened to brackets for an inverted "V" structure behind the seat. Extra brackets were installed for additional security. A bracket also supports the center of the tube to lessen possibility of bending. The complete installation cost $40. Pease, who also installed a stall warning indicator, made these changes following an aircraft accident.

PRIVATE CHANNEL

Latest CAA report (November 25) lists 322 communications stations equipped and continuously guarding the 122.1 Mc private aircraft channel. This leaves a balance of 27 stations where the equipment has not been commissioned.

F. B. Lee, CAA's Deputy Administrator, said "Installation of this equipment at CAA stations and towers is continuing, and the program should be completed in the near future."

MEDICAL REQUIREMENTS

Over 150 AOPA member physicians were asked last month to help their association determine what policy will be followed regarding regulation changes proposed by CAA's Medical Section.

After lengthy arguments, medical requirements for private pilot certificates were simplified last year—and the family physician was permitted to perform and certify medical check-ups required under the Civil Air Regulations. AOPA spearheaded the request for these changes.

CAA's Medical Section now asks that Civil Air Regulations be amended to comply with existing ICAO (International Civil Aviation Organization) standards. AOPA is opposing this action as it will increase the number and complexity of present medical requirements.

Flying physicians may obtain medical questionnaire from AOPA.

AIRPORT RATING

Airport certificates have been presented to 976 airports rated "Above Average" and "Superior" by AOPA pilots, according to J. B. Hartranft, Jr., AOPA general manager.

Stating that the association hoped to have every U.S. airport rated by March 1, Hartranft urged all members to fill in airport rating cards.

RADIO

Radio manufacturers will meet with AOPA this month to discuss the association's recent release giving its specifications for private pilots' VHF navigation and communication receiver.

Copies of this 30-page technical document are available to radio technicians and pilots upon request.

DEAF PILOT

When AOPA members George W. Truman and Clifford Evans landed their globe-circling *Super Cruisers* in California, [see page 15] Rhulin A. Thomas, deaf AOPA member of Washington, D.C., was on hand to welcome them.

Thomas, who believes he is the first deaf pilot to fly coast-to-coast, took off October 26 from Rehoboth Beach, Del., and arrived at Van Nuys, Calif., November 7.

Since he is totally deaf and speaks only a few syllables, Thomas learned all of his flying maneuvers by passing a pad and pencil back and forth to his instructor while he was aloft.

He now has 220 hours and will work for an instructor's license in order to teach other deaf men and women to fly.

Homemade harness designed by Clement Pease of Boston costs $40, offers protection against head injuries in crashes (see text). Aircraft accident surveys indicate that most head injuries can be prevented by use of harnesses. Inset shows tube used to anchor the strap.

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The Brass-Hat Squadron

(*Continued from page* 33)

members one time he flew three round trips between Washington and Paris in 11 days. "There wasn't any sleep for us then, excepting the two nights we spent in Washington."

Christensen would rather go out on trips like the one Captains William E. Gregg and Robert W. Carroll piloted for a group from the Senate and House foreign affairs committees. They left September 5, were gone 38 days and visited 22 countries.

Five-foot-five Captain Gregg is an old-timer among the Brass Hat pilots with 13 years cockpit experience. As a pilot, Gregg is respected, but the other boys look down on his suggestion that all Special Mission Fleet planes should carry pretty Wacs for stewardesses. The other pilots object because half the time they would be hunting for a well-chaperoned place where the girls could sleep while staying in a foreign port. The anti-Gregg men want male stewards who'll shift for themselves.

There is hardly an airport in the world which is strange to all the pilots. Of course there are a few airports, like some in Russia, where they don't like casual visitors and where Brass Hat landings have been rare. Right now, when assigning a crew to a flight, Maj. William F. Shanklin, CO of the Special Mission Fleet, generally sees to it that one member of the flying crew has made at least one landing on every port of call so there will be no misunderstandings.

People used to riding behind the gray heads of the scheduled commercial airline pilots are a bit taken back by the age of the Brass Hat pilots. They average about 28 years and a few of them were never in an airplane before they entered the AAF's wartime pilot training program. Most of them are married, most are reserve officers and there isn't a West Pointer among them. The most amazing thing about them is that these fellows, given the responsibility of carrying big-game cargo on world-wide jaunts, are just first lieutenants and captains and not lieutenant colonels and colonels as you might expect.

This lack of rank amuses the pilots because as captains of the planes they are in command of everything and everyone aboard it. "Ike" Eisenhower might be sitting in a seat but technically he takes his orders from the first lieutenant or captain pilot.

Before entering the Special Mission Fleet the pilot must have proved himself as a *Skymaster* skipper. Major Shanklin won't accept a new man unless he has an accident-free record of at least 2,500 hours of which 500 must be in *Skymasters* as pilot and 1,000 in four-engined aircraft. In addition, he must have a Green—equal to a CAA—instrument rating, a pleasing personality and be reasonably good looking, which probably accounts for the fact that approximately two-thirds of them are married.

These qualifications are only for a first pilot. A captain must have all that, plus 500 additional hours' experience as a *Skymaster* pilot. On long flights there is often a third or co-pilot carried along to serve as an animated "iron pilot." This man—an excellent pilot by most civilian and AAF standards—has a *Skymaster* rating, an ordinary instrument card and about 1,000 hours' experience. The co-pilot is allowed to hold the wheel while the plane is in flight, cruising at flight altitude and when not on instruments.

"Spin it once more, Joe. I know it will start this time!"

There was a time in the early days of the Special Mission Fleet when only airline pilots who had been commissioned in the Army were allowed to fly Brass Hat missions. Now most of the airline men have left the service and their old cockpits are filled by Army-trained men.

Airline men were in the cockpit when the Brass Hatters almost marred their perfect no-accident record. It happened in the early days of the group when the squadron used any and every type plane on which they could lay their hands. A Lockheed *Lodestar* was hauling a group of passengers west when the plane caught fire. The pilots ordered the passengers to bail out. The plane, empty, crashed in a burning heap but the passengers floated to earth unscratched and unharmed.

Third ranking officer on the crew is the navigator, again the best man the AAF has to offer. Typical is Capt. Paul H. Pflug who holds a Class III navigator's ticket and has way over 3,000 hours' flying experience. One thousand five hundred of those hours are over water and another one thousand are night flying time. He understands and can operate the latest navigating equipment, including radar, Loran, and radio compasses and altimeters.

Once Captain Pflug was navigating a flight westward toward China when he was stricken with a sore throat. The medics were a little overcautious and threw him in the hospital at Shemya, the next to last island in the Aleutian Chain. Eight days later a very healthy Pflug convinced the medics that he didn't have diphtheria and set out to rejoin his crow. The crew, however, hadn't waited and had taken off with two navigators picked up at the Shemya airport. Both of these substitutes were supposed to be "hot"—but they missed their estimated times of arrival by two hours—an unthinkable thing for Mr. Pflug or his six other Brass Hat navigating colleagues.

Pflug, left to his own devices, started aerial hitch-hiking back to Washington. He must be the world's best or at least the world's luckiest hitch-hiker because the entire unscheduled trip took him less than 3½ days and six airplanes.

Pflug, incidentally, has taken up golf since joining the Brass Hatters. He loves the game and has played it all over the world except in one country. "I just can't seem to find time to play in the U. S.," he says. "Sometime I'm going to get the time." He claims the easiest course is in Switzerland and the toughest in Germany. He shoots 103 with the Swiss and 108 with Germans—for nine holes, that is.

Top non-coms on the Brass Hat *Skymasters* are flight engineers. Three are assigned to each plane and they decide among themselves which two will make the trips. This little scheme is believed to be the brainstorm of CWO Robert Doherty, veteran of 18 years in AAF aircraft mechanics, who supervises the Special Mission Fleet's maintenance. Doherty believes that any mechanic who knows he will be a passenger in an airplane is not very apt to do a poor repair job on that plane. This system is a rather grim and

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Doherty would be a lightplane owner's delight—if the lightplane owner could afford him. To this old Army man, an engine with 700 hours is ready for replacement. An airplane with from 3,000 to 6,000 hours is starting to creak and is due to go back to the factory where it will be so completely rebuilt that all time can be erased from the logs. Doherty never harbors a question about the condition of anything. If some part of the airplane is doubtful, that part is replaced with a new or rebuilt part immediately.

The warrant officer is just like the rest of the Brass Hatters in his "ain't-had-an-accident-yet" wood rapping, but besides rapping on wood, Doherty is practical and ever-so-thorough in his work.

It's from the flight engineers that you get the savor of the Brass Hat Squadron. There is nothing silent about any enlisted man in any Army unit and especially among a group of enlisted men who have been working on airplanes for an average of 12 years each.

Flight Engineer Greco thinks that President Hoover, whom he met on a recent food mission flight, is a "nice old man" who is always on time at the airport. He couldn't say as much for the assistants who traveled with him but Greco solved that. He just started hiding their luggage and after a few mornings the assistants wised up. "I didn't have any trouble after that," Greco recalls. "Soon they started showing up maybe a half hour before we were to take off and would start rootin' around for their bags. We didn't have to wait for them once after that."

Greco is more verbose about the passengers than are the pilots. He remembers General Marshall as a nice gentleman who'll excuse himself for being in the way every time someone walks down the aisle in the passenger compartment.

"Most of the really big-shots are good guys," he says. "The jerks come from the little guys who travel with the big guys."

Another engineer, M/Sgt. Jess Kerekes, has been flying in *Skymasters* since the first one rolled out of the Douglas factory. He loves the big planes and claims they are the best in the world. He's like Greco, however, in being unimpressed by the "big-shots" and the major meetings attended by the "big-shots." In fact, he wishes he had never been assigned to the crew carrying people to the Potsdam Conference because the crap game there cost him $980.

Kerekes has been everywhere and has visited just about every important city in the world. There is only one place that he would like to see again and that's Java —"it sure is a beautiful place."

Kerekes recently became a father while his plane was on a mission, and the men at Brass Hat headquarters sent radio messages to every port along the route at which the plane was scheduled to land. "I nearly went nuts," he said. "Every time I landed there was a message about another baby. The doctor told me we were only going to have one."

Serious T/Sgt. Marvin E. Splonskowski represented the radio operators. He spoke about radio operators with whom he had often "talked" but never seen. The best ones, he said, are the Russians and the worst are the Brazilians "who have an entirely different way of keying."

When flying over Russia or Argentina, radio operators and navigators take it easy as both countries insist on placing their own men aboard.

Splonskowski is a Roman Catholic and was most impressed one day in Rome when he was invited to attend a private audience with the Pope. "He gave us his blessing, medals and rosaries. He's a nice old man who speaks good English, but rather slowly."

Splonskowski agreed with other Brass Hatters in that English is the best language for the globe-trotting tourist. "No matter where you go," he said, "you'll find somebody who understands you."

Completing the crews are the stewards or, in AAF terminology, the Flight Traffic Clerk. These fellows are just about the only men in the Army who serve GI chow guaranteed not to give ulcers. According to Captain Mills, the stewards have attended a special ATC school where they learned passenger manifest duties, short-order cooking and serving, berth making and the many technical details concerning passports and visas.

Sgt. Bobby B. Hayes, an ex-paratrooper who reenlisted in the Air Force, now has the steward's "sir" habit so badly that recently he caught himself saying "sir" to his girl friend. He said that there is a tendency for stewards to wear mess jackets on most runs—"although there is no order about it."

Someday, he believes, there might be a uniform issued like the one General Spaatz requested for stewards working on one of the General's trips to South America. Those stewards wore white trousers, white mess jackets and white shirts. The final touch was a bow tie. This uniform, Hayes thinks, may not be military, but it is much more practical than military issue.

The meals served by Sergeant Hayes are usually cooked on the ground and are carried along on the plane in electrically-warmed containers. The meals cost the passengers 25 cents but, unless they are obtained at a GI flight kitchen, cost the Government about $2.50.

Of all the crew in a Brass Hat *Skymaster*, the steward has perhaps the best chance to meet famous people. It isn't rare for him almost to live with a big-name for more than a month.

Sometimes the life of a steward can get rough, like the time outside Oshima, Japan, when Captain Pflug was thrown around the cockpit when the plane hit a violent down draft. Pflug ended up with a badly-cut nose which is still scarred. "As I lay there in the cockpit I looked back through the open passenger compartment door at the steward. He had gone sailing through the air, crashed into the coat rack and landed in a heap under the icebox. He looked up at me yelling, 'I'm okay, sir'."

The Brass Hat Squadron got its start shortly after the old Air Corps Ferry Command became the ATC in June, 1942. Conferences such as the one at Yalta showed a need for a special unit detailed to do nothing more than haul high-ranking officials to important war and world politics meetings. What was needed was a group which could fly to points all over the world as swiftly—and as safely—as possible. What emerged was the Special Mission Fleet or, unofficially, the ATC's Brass Hat Squadron.

Records aren't kept on the number of miles covered or the hours flown, but anyone connected with the Brass Hatters will assure you that the numbers aren't

15 YEARS AGO

FROM the February, 1933, issue of this magazine:

The Nieuport-Delage 590 was a new French plane designed for both military and commercial purposes. Called the *Colonial*, it was a three-engined, all-metal job, equipped with shortwave radio. As a military plane it could be fitted as a hospital ship or with two machine guns, a camera, 50 grenades and two bomb racks.

Latest plane from the Potez factory in France was the Potez 50-A2 which broke three world's records in a single flight and took from America the record for covering 312 miles with a 220 pound load. This record was formerly made in the United States by a Lockheed *Vega*. The Potez was a two-seater observation plane equipped with a Gnome-Rhone 700-h.p. K-14 engine.

The life and duties of an air hostess were considered so unusual, interesting and intriguing that they were dramatized in the motion picture "Air Hostess" produced by Columbia Pictures. Latest statistics showed there were about 50 air hostesses in the United States.

Hans Richter, the first glider pilot to soar across the English Channel, had constructed a powered glider which he intended to sell for 2,000 marks. It was said to be inherently stable because of its seagull-shaped wings. It was powered by a 23-h.p. four-cylinder engine mounted at the rear of the wings. The nacelle, engine, tank and controls were all mounted in one unit so that the wings could be removed easily without interfering with the connections and other apparatus in the nacelle.

Under construction was the Gerin French variable wing plane. Essential part of the plane was the wing which was supported on a pair of streamlined longerons and internally carried a heavy chain which supported fins perpendicular to the length of the wing. With the small wing surface, resistance was reported to be small and enormous speeds could be attained without any increase in lifting power. With wings extended to full size the Gerin plane could take off and land safely at low speeds. The plane was designed for a top speed of 204 m.p.h. with a landing speed of 40 m.p.h.

The Kitty Hawk monument, a 60-foot granite pylon, was erected by the Government in commemoration of the Wright Brothers' flight on the summit of Kill Devil Hill, Kitty Hawk, N. C., at a cost of $250,000.

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The 120 is essentially the same as the 140 pictured above but has an 85-h.p. engine, less luxurious interior and is not equipped with starter, generator, battery and flaps. Both are rugged all-metal-structure airplanes with ranges of over 450 miles. See your Cessna dealer.

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small. However, with all the flying into and out of strange airports and countries, there has never been a passenger hurt.

All types of planes have seen service in the Brass Hat Squadron—Douglas *Skytrains* and *Skytroopers*, Beechcraft *Voyager* (C-45), converted Boeing *Flying Fortresses* and Consolidated *Liberators*, and Lockheed *Lodestars*. The fleet standardized on Douglas *Skymasters* in October, 1946, and Major Shanklin says there are no plans to replace the present craft with other types. He believes that the C-118 (DC-6) recently purchased for the President's use will be the only plane of its type to go into ATC passenger-hauling service.

The President's planes, the *Independence* and the *Sacred Cow*, are attached to the Special Mission Fleet for maintenance, but they are under the command of the White House and Lieut. Col. Henry T. "Hank" Myers, the President's personal pilot. Every once in a while a Brass Hat crew will be assigned to fly the *Cow* if Colonel Myers is unavailable. Captain Mills is usually the relief pilot.

You might expect to see a "plush" job when you walk along the Brass Hat flight line at Washington National. Instead are some of the drabbest appearing exteriors in the Air Transport Command. There is no fancy paint job, only black lettering along the top of the fuselage proclaiming Air Transport Command. The only identification is the plane numbers painted high on the vertical fin. It's that number which singles these planes out from a stripped-down cargo-hauling job. These "plush" planes aren't for show but for hard day in and day out use. Mechanically, they're as perfect as any airplane can be.

Up front on the flight deck are the standard instruments and controls of the airliner version DC-4. Aft of the left-hand pilot's position is a nook reserved for the radio operator, his transmitters and receivers. To the operator's right is the navigator's position and all the electronic, optical and mechanical tools of the modern aerial navigation trade. Directly behind the flight deck proper is a crew stateroom where the crew can rest on long flights. Here is a toilet and two bunks plus any additional equipment which there just isn't room for in the cockpit.

The passenger interiors reveal hard use. They aren't fancy, and a worn spot or two is not too difficult to find. Right now, Special Mission officials would love to send a few planes back to the factory for a complete interior refinishing—if they could get the planes out of service long enough to get the job done.

Passenger compartment arrangements differ with the type of service expected from the aircraft. Numbers 9147, 9149, 9150, 9028 and 5516 are "executive" types which can accommodate 15 to 20 people, depending on how many bunks and tables are installed. These planes are used on missions during which the passengers will do most of their work in the aircraft. Numbers 9055 and 9066 are standard passenger-carrying airplanes much like the DC-4 airliner. These latter are used when only transportation is needed by the passengers.

Many foreign bases recognize the planes instantly from their numbers, and control tower operators don't need a flashy paint job—such as that of the *Independence*—to let them know that Brass Hat cargoes might disembark on their fields.

Sometimes over-eager tower operators amuse Brass Hat crews. When a plane is returning to Washington empty it always picks up a load of passengers from the nearest ATC terminal and carries them in the seats occupied a few hours before by "big-shot" cargo. Every once in a while an operator will spot a Special Mission plane and flash word to the commanding officer of his field that a Brass Hat plane is landing with an unknown load of dignitaries. And often the welcoming generals and colonels will rush up to the plane to greet the "big-shots" and out step a couple of privates who are hitch-hiking a ride. The crews love incidents such as these; such magnificence, such swiftly-arranged formalities, such sputtering, such blushing!

There's no rule as to who'll ride a Brass Hat plane from Washington to any spot on the globe. If the AAF thinks the passenger wanting quick transportation is important enough, he'll get a plane. Usually the planes are arranged through a chain of command which operates something like this:

Members of Congressional committees or the White House or State Department contact Army liaison officers assigned to their respective groups and request transportation on such and such a date for so many people. The liaison officers then contact the AAF and flight planning begins. Orders shuffle around Air Force headquarters and eventually someone informs Maj. Burt. McKnight at ATC headquarters. It's McKnight's job to determine which planes are available and which of these planes will suit the needs of the party to be hauled. McKnight then assigns a plane, plans the route to be followed, arranges for food and sleeping accommodations and other housekeeping details. He then sends the information about the flight to Major Shanklin who assigns pilots, navigator and steward to the trip. Engineers and radio operators are not selected, as each plane is assigned a permanent force to handle these duties. The trips for pilots, navigators and stewards are assigned by the major on a first-in, first-out basis to assure that everybody gets about the same amount of loafing and flying. The major is also constantly rotating crews and seldom do the same men fly together in the same plane more than once.

Doherty then takes over and sends the plane up to Westover Field, Mass., where it is given a 50-hour inspection and returned to Washington. In Washington the plane is stocked with food, given a final checkover and taxied to the ATC Terminal to await the passengers' arrival.

The hour of flight arrives. The crew, wiping away the last red traces of their wives' goodbyes, stand at semi-attention under the plane watching as the official farewells are said. The President might be there and most likely there will be a raft of high-ranking brass and Washington big-wigs. Finally the ceremonies are over and the crews scramble aboard through the front entrance hatch. Engines are started, radios are checked, the plane taxies out and the take-off is made.

Destination? It may be anywhere and everywhere. It isn't rare that the trip will take the crew entirely around the world. Maybe they'll see the Finnish air force boys again and there'll be another party like the last time when three pretty girls stood behind each chair. One had a jug of wine; the second, whiskey; and the third, blue-lightning vodka. "Ah . . . that there was a party to end all parties."

Maybe someone will give them a medal like the one the Chinese gave for bringing Madame Chiang Kai-Shek back to China. The enlisted men got the Order of the Seventh Cloud and the officers the order of the Fifth Cloud. "Heaviest damn medal we ever got," says M/Sgt. Edward Schrempf. "We had to use full flaps to get them off the ground." END

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Jack Northrop and His Wonderful Wing

(*Continued from page 20*)

conventional plane with a tail assembly.

2. *Simplicity of construction.* The wing is a single unit in which the structure extends from tip to tip with no added fuselage. Such design speeds production, cuts costs.

3. *A better distribution of weight.* Compartments along the span carry cargo, distribute the weight along the wing surface, thus eliminating the need for excessive "beefing up" which is necessary in ordinary planes where the weight is concentrated in the fuselage.

4. *Ease of loading and unloading.* Any part of the wing's load is easily accessible through its own cargo door.

5. *Military advantages.* The wing presents a smaller target when engaged in offensive or defensive maneuvers.

Comparison between a wing and a conventional aircraft is best illustrated, Northrop claims, by performance statistics obtained from patent figures and backed by three years of tests with wing-type planes.

These figures show, he states, that if two planes—one a wing and the other conventional—are built for the same purpose with identical power, gross weight and fuel load, the wing will: (1) carry one-fourth more useful load; (2) travel one-fourth farther with an identical fuel load; (3) transport 25 per cent more load over a given distance on a given amount of fuel and (4) travel substantially faster with the same thrust or applied horsepower. Northrop engineers believe the XB-35 to be at least 20 per cent faster than a conventional craft of the same load and horsepower.

In the question of size, the wing is again "radical." While the majority of the fuselaged-planes have a maximum limit to which they must adhere because of structural and aerodynamic problems, Northrop engineers claim there is almost no upward limit to the size and tonnage in which flying wings can be made. They claim that the value of the wing design increases greatly as the size of the aircraft increases.

Larger flying wings give thicker air foil sections, which means greater head room and clearance along the span. Thus, in a wing of approximately 400,000 pounds gross weight, the leading edge might possibly be an observation deck using windows in a large mesh geodetic structure and housing people in staterooms or quarters back in the wing.

However, the wing is definitely not for lightplane owners. It would be virtually impossible to build a wing small enough to meet the demands of an economy-minded lightplane public and still adhere to the theory of a craft which prohibits any external appendages that might create drag without adding lift.

In the event that a small wing was produced (such as the early N1M) it would probably be too expensive to buy and fly, too short on passenger space and too long on speed for the average private pilot.

The YB-49 is, as Jack Northrop puts it, "a reconciliation of many incompatible aerodynamic theories which lots of folks said were impossible."

During 23 years of dreams, Northrop has upset many established notions about aircraft. He and his associates fathered numerous aeronautical inventions, many of which are now embodied in the wing. Some 60-odd patents have been awarded to Northrop, as assignor to Northrop Aircraft, Inc., by the United States, Great Britain, Canada and Australia. Twenty-nine of those patents were concerned with the design of the wing itself. Actually, there are only three fundamental patents which cover the flying wing as a complete aircraft.

The first one of these Northrop wing patents—the "All-Wing Airplane"—was filed on January 10, 1940, shortly after the formation of the present Northrop corporation.

One of the most interesting was the "twisted wing," a wing in which the angle of attack of the wing chord decreases toward the wing tip. This is technically known as "washout." According to the patent papers, this feature was accomplished by giving the wing structure a "forward twist so that the chords of the wing sections progressively decrease in angle of attack from root to tip."

The purpose of this was to give the wing tips a down load which would help trim the airplane in normal flight.

Included in the first wing patent were turned-down wing tips. These served as stabilizers, designed to aid in the prevention of excessive yaw and to help in making banks and turns. Northrop men, after preliminary flight-tests, were surprised to find them unnecessary.

Under another design patent the turned-down wing tips were discarded and the wing was given the conventional tip design it has today.

One of the most serious problems faced by Northrop was the question of the wing's stability. To prove satisfactory, the plane had to be stable about its three major axes—roll, pitch and yaw.

Conventional planes are given stability through the use of positive wing dihedral (for roll) and through the use of a tail section that has both horizontal and vertical stabilizers (for pitch and yaw).

It was a relatively simple task to give the wing a positive dihedral angle, but it had neither fuselage nor tail section and it was apparent there would be a problem of stability in pitch and yaw.

Northrop presented the answer. By using a sweptback wing (setting the two halves of the wing at an angle—like a shallow V, point forward), and combining this with the effect produced by his "twisted" wing, he gave his aircraft pitch stability.

In solving the yaw stability problem, he came up with the reconciliation of several other incompatibilities which had been making his work difficult. This multi-cure-all took the form of pitch-control flaps situated at the tips of the wings. They helped Northrop over a problem which had been the defeat of many other would-be all-wing designers—that of excessively high landing speeds.

And, at the same time, an adaptation of the pitch-control flaps, called "drag rudders," not only did the same work as the horizontal stabilizers on planes with tail sections, but provided several other operating factors.

Working with Dr. William R. Sears, former company chief of aerodynamics and now head of the school of aeronautics at Cornell University, Northrop modified

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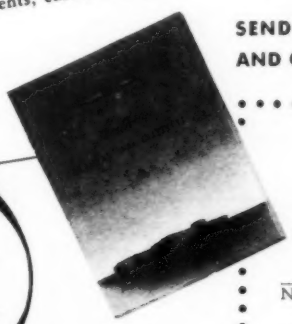

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the pitch-flaps so that they were split on the trailing edges, working like an alligator's jaw—similar to some dive brake installations.

When open, these surfaces act like a small parachute fastened to the ends of the wing. They create a drag which forces either wing tip backward, as the pilot desires. In this way, the Flying Wing is given excellent directional control.

In addition, the initial purpose of the pitch-control flaps—to decrease excessive landing speeds—still functioned perfectly. These flaps counteracted the pitching effect caused when the landing flaps were extended, thus allowed the use of a larger flap area and slower landing speeds.

The operation of these pitch-control flaps is quite simple now.

When the landing flaps are extended, the nose of the wing—like the nose of any conventional plane under the same circumstance—is thrown downward by the drag at the bottom of the trailing edge. By raising the pitch-control flaps on the upper surface of the wing, the nose is forced upwards, thus seeking a safer level of equilibrium.

Both the pitch-control flaps and the "drag-rudders" can be operated independently of each other. Because of this, they are extremely useful as trim tabs under ordinary flight conditions. Also, in the event of an engine failure, the two control surfaces can be employed to sustain normal attitude of the plane.

There is still another way that the drag-rudders may be used by the pilot.

In a conventional aircraft, when one rudder pedal is depressed the opposite pedal reacts by extending until one pedal is all the way in and the other is all the way out.

This is not so in the flying wing. Its rudder pedals, which control the drag-rudders, can be depressed simultaneously. When this is done they serve as air brakes, slowing the plane down without causing any change in compass heading.

Another fundamental patent for the flying wing, as a complete aircraft, is "provision for an aircraft which has low static stability, yet is easily maneuvered without losing its inherent stability."

These high-binding words mean that the patent covers methods by which the flying wing is so accurately balanced on its axes that it is easily maneuvered, and yet has sufficient built-in stability to provide for complete control and full safety.

Flying wing engineers explain that since the craft does not have an extended tail assembly it does not have a long lever arm on which its elevators and rudders can be placed. These controls, which would normally be quite some distance from the center of gravity, are now relatively close to it since they are placed in the trailing edge of the wing.

Because of this, the controls must operate efficiently and effect the desired change in the plane's attitude with the least amount of control movement. The static stability of the wing must be low to make that possible. In technical parlance, the static stability of the wing must be low so that the forces of dynamic stability, needed to effect a change in attitude, will also be low. Otherwise, a large movement of the controls might disrupt the flow of air over the wing surfaces and destroy too great a quantity of lift before any change in attitude is obtained.

Northrop succeeded in safely maintaining this precision balance of the flying wing by combining a low dihedral angle (less than two degrees) with the inherent low yaw stability, and by distributing the plane's gross weight along the lateral axis in line with the center of gravity and making provisions for the additional loads to be placed along this same line rather than on a longitudinal axis as must be done in the fuselage of the conventional type plane.

As a result of the loading features, the flying wing pilot's problem of weight and balance is different from that of the ordinary cargo or bomber plane. In the latter, when loading or disposing of a part-load the pilot must be sure he is not causing the plane to become nose or tail heavy. The wing pilot, on the other hand, must be certain that he is not making the plane right or left wing heavy.

In designing a perfect flying wing—one in which there are no protruding nacelles or extraneous contours which have a parasitic drag and do not give lift to the plane—Northrop had to plan a way to cool the engines which are housed internally. (Early in his wing research he had found it best to use pusher-type engines so that there would be a minimum of interference to the flow of air over the airfoil.) Once again his answer solved not one problem but two.

Intake slots for the cooling ducts were placed in the leading edge of the wing at approximately the point where the boundary layer (see "Wing with a Future," FLYING, October, 1946) starts to build up at the beginning of a stall. The slots, by removing the boundary layer, improved the lift of the wing and delayed the stall angle. With this, substantial increases in the angles of attack became possible.

After ironing out the question of low static stability and making it possible to maneuver the wing with comparatively small movements of the control surfaces, a full-boost hydraulic system was needed to prevent excessive control pressures. This was installed, along with an auxiliary electrical system which could be used if the hydraulic devices failed.

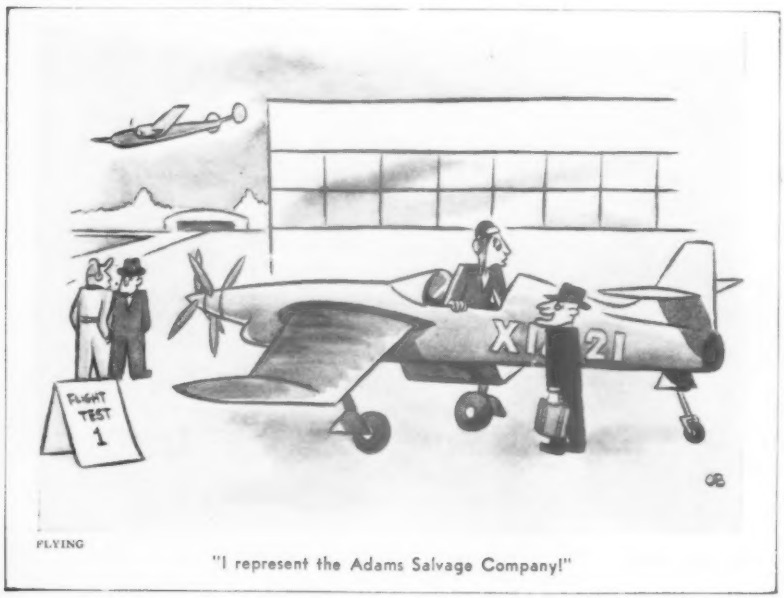
The solution for controlling the plane had been so well designed that there was little or no "feel" to the controls themselves. Ground tests showed there was little difference in control pressures when the plane changed attitude. Whether the wing was diving, stalling or in normal flight, the "feel" of the control remained practically the same.

Working with control experts, aerodynamicists designed a pneumatic device which put feel back into the controls.

This device resembles a large metal ball in which there is a diaphragm separating the inside into two sections. From one section of the ball a pipe runs to the leading edge of the wing where it ends in an air-scoop. The air, according to the speed of its flow into the scoop, travels through the pipe and exerts a pressure against the diaphragm. This in turn operates an actuating arm which supplies a proportionate amount of friction or "feel" to the controls.

Not all the work on the flying wing was done in the engineering laboratories or the patent offices. Much of the background took place in the air with the scale model predecessors of the XB-35 and YB-49—namely the N1M and the N9M.

A great deal of important information and data was obtained through flights with these wings, the first of which was flown at the Muroc Army Air Base in 1941. Since then more than 600 hours have been logged for the various types of Northrop wings. END



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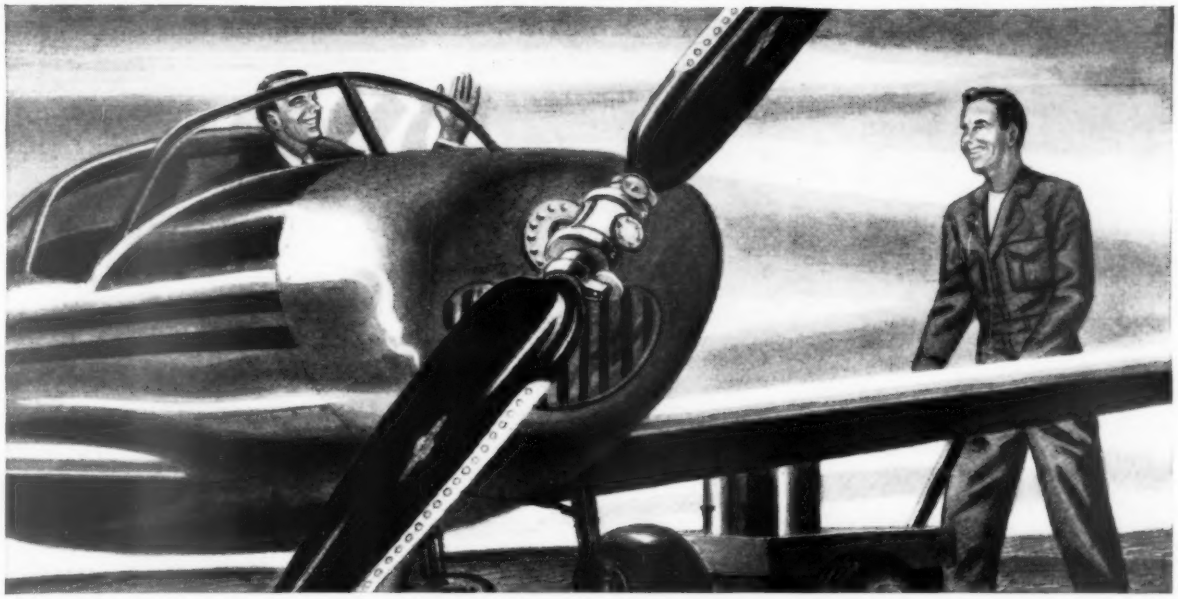

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Tourists' Airline

(*Continued from page 24*)

self), and extravagant meals aloft (you are served sandwiches and coffee instead of club plates).

An ex-Pan American senior pilot and Navy veteran (and once a FLYING contributor), Kail is top operations executive for one of the largest non-sked outfits now in business, the American Air-Export-Import Company, popularly known as AAXICO. AAXICO has flown 90,000,000 passenger miles with some 50,000 passengers in less than two years of operation. It hasn't had an accident.

Kail says that his outfit makes money flying customers at 3.5 cents per mile without mail, as contrasted with the average scheduled airline rate of 5 cents with a mail subsidy. He and other non-skeds, including Trans-Caribbean Airlines, Resort Airlines, and Modern Air Transport Airlines, this winter are campaigning with CAB to let them in on some of the scheduled franchises, giving cut-rate competition to the established air transport services.

For example, AAXICO during the summer of 1946 flew as high as 11 trips a day (non-scheduled) from New York to Atlantic City, a route already under franchise by Eastern Air Lines but not serviced by them. Last summer, the Board made AAXICO cut it out, yet Eastern made no flights to Atlantic City all summer. Why, Kail asks, can't AAXICO be given the New York-Atlantic City franchise which Eastern isn't servicing and which, if Eastern did service, would cost the customers more?

Eastern is ready with a score of answers to the question, claiming that their overhead, especially on four-engined equipment, is far higher than Kail's. It costs more to fly four engines, too. Beyond that, Eastern is as eager to serve Atlantic City as he is but was delayed until last fall because of contract troubles with the Atlantic City fathers, who wanted Eastern to gold-plate their airport with high landing and rental fees.

Indications are that the Board will back Eastern in this stand and that Kail and Company will have a tough time getting in on the scheduled transport business on a "second class" basis. His drive may have some effect on scheduled rates—"We are as eager as the non-skeds to see the lines operate for less and even without mail subsidies," says a Board spokesman—but it seems unlikely that he or any of the other non-skeds will get very far with their dream of second class air transport services.

Consensus is that AAXICO and many another well-manned, safely operated non-sked will do big things in the non-sked tourist field, however. Regular airline officials, queried on the non-sked tour idea, said even if they opposed the tourist flights they don't think they could block them under present Board rules.

Luck is already something that rides with AAXICO, and the line has built up a flourishing tourist business. While some of it, like the Atlantic City run, steps on scheduled airline toes, most of it is legitimate and is prospering.

FLYING

"Well—there goes all eighteen years' supply!"

Kail gets his business where he finds it. AAXICO planes have flown British actors and cameramen working for Arthur J. Rank into South American jungles for movie shots. A planeload of Notre Dame fans flew into New Orleans from Miami for the Army game last year in an AAXICO ship. A bunch of Miami sportsmen discovered that there were no hunting laws in Haiti. They left home one Friday afternoon and four hours later were within shooting range of some of the best game in the Western Hemisphere.

Using these examples as a point of departure, AAXICO is now experimenting with "packaged" air tours. Customers are signed up in a number of neighboring cities—say, Cleveland, Pittsburgh and Cincinnati. They are sold a two-week tour of the Mediterranean at a flat rate which includes hotels, meals, and air travel. An AAXICO plane "leap-frogs" until it is loaded with customers and then heads south, so that no customer has to make a long trip to get to the resort ship. They are delivered at their home field on returning. While this work is still in an experimental stage, Kail hopes to prove it profitable and establish it permanently by the end of the winter. He then plans to expand both the number of cities he services and the distance of the tour itineraries.

How AAXICO flies at 3.5 cents per mile per passenger is no trade secret, nor is Kail reluctant to tell how AAXICO has succeeded in the non-sked field when scores of other outfits folded.

"Three things which we discovered the hard way got us out of the red," he says. "We favored inexpensive travel, but not cheap, bucketseat travel. Maintenance and safety are at the top of our list of musts, and customers must be comfortable. Our planes have hostesses and we pride ourselves on customer courtesy.

"Second, when times got tough we didn't wait—we got tough, too. We have had as many as nine planes. When we had to retrench, we sold four to pay off debts. We also cut personnel from 250 to 60.

"Third, we didn't try to make ours an all-veteran or an all-civilian operation. Many of our pilots flew with NATS and ATC. Howard J. Korth, AAXICO's president, is a Navy veteran. But those in charge of maintenance are predominantly civilian—they know what things cost and how to watch costs."

These last were responsible for one of AAXICO's best early moves—to stock up $250,000 worth of spare parts and engines. Beyond that, all pilots and executives were let in on a profit-sharing plan—10 per cent of the net each month going to the working personnel.

AAXICO's operations have been mostly on the East coast and in the Caribbean so far. Headquarters are at 204 W. 55th Street, New York, with a large branch at Miami. But branch sales offices for the tourist trade already have been opened in Pittsburgh and Cleveland, and there will, according to Kail, be scores of others as the travel service expands.

"After all," he says, "we have the whole world to fly to and all the tourists in the country as potential customers." END

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Global Joy-Ride

(*Continued from page 16*)

tion of their trip. The idea came to the pair last year. Truman, 39, is a native of Saskatchewan, Can., but came to this country in 1915 and later to Los Angeles, where he was a motorcycle hillclimbing champion, diving expert and bowling team ace. He learned to fly in 1928, meanwhile running a restaurant in Glendale. During the war he was a civilian flight instructor at the Visalia Army Air Field, afterward serving a year in the Air Transport Command. Discharged, he settled in Washington, where he was an instructor at Brinckerhoff Flying Service, College Park, Md. He is married and the father of twin daughters.

Evans, 27, also was a flight instructor at Brinckerhoff's, where his casual remark that "you could fly a Piper *Cub* around the world" planted the germ for the odyssey. Evans was born in Washington, D. C. After two years at American University, he joined the Air Corps. He flew anti-submarine patrols from Greenland and logged more than 400 hours over-water flying. He later flew *Skytrains* in the CBI Theater, returning stateside as a captain to complete his services at the Pentagon. He then enrolled at Maryland University to study aeronautical engineering. He also is married and has two daughters.

First, the two had to obtain the airplanes. Their appeal to the Piper Company resulted in the gift to them by William Piper, Jr., of two stock-model PA-12 *Super Cruisers*. Both were used but the steel and aluminum structure was in good repair.

Empty weight of this type plane, with engine, is 950 pounds, with a normal load weight of 800 pounds, bringing the normal gross weight to 1,750 pounds. The two world-circling planes finally grossed about 2,200 pounds when ready for flight. They have a 35 ft. 5 in. wingspan and a length of 22½ feet. They cruise at 105 m.p.h. and have a top speed of 115 m.p.h.

The flyers' next job was to obtain engines. Officials of the Lycoming Division, Avco Manufacturing Corporation, were happy to cooperate. Knowing their "customers" meager finances, Lycoming sold them the engines for $1 each.

These engines are regular "off-the-shelf" Lycoming O-235-C models. They are direct-drive, four cylinder, horizontally opposed, air-cooled, rated at 100 h.p. at 2,600 r.p.m.

Then came the "deal" for propellers. Two new McCauley metal props were obtained for maximum efficiency in both take-off and cruising. They are thin, fixed, all-metal blades which require a minimum of servicing.

Truman and Evans now had the planes, the engines and the propellers. Their next problem was instruments. They needed many more than are standard in stock model *Super Cruisers*. Their drift meters were home-made by Evans. Kollsman Division of the Square D Corporation came to the rescue and supplied the following for each plane: Air temperature indicator, vertical speed indicator, tachometer, sensitive altimeter, air speed indicator, vertical dial direction indicator (compass), a clock, oil pressure gauge and oil temperature gauge.

From the Sperry Gyroscope Corporation they each received a Sperry Gyrosyn Compass and a Sperry Gyro Horizon.

Bendix Radio Corporation loaned them each 27 pounds of valuable radio equipment, including a Bendix Standard and VHF Transmitter for long range static free transmission and communication, and a Bendix Receiver with two bands for reception of standard commercial and airways broadcasts. Spot tuners permitted reception on 2870 and 6440 kc for interplane communication, while directional loop antennas enabled them to take position bearings and to "home" on radio stations.

Electricity was supplied by Delco-Remy engine-driven generators and heavy duty Reading Rebat aircraft batteries. The Goodyear Company gave them two full sets of tires to replace the ones worn thin in practice landings.

Their next problem was range. Standard *Super Cruisers* have a fuel capacity of only 38 gallons in the wing tanks. They needed much more. This they solved by pulling out the rear dual seat and installing two tanks, each of 50 gallons capacity, in each plane, giving them enough fuel for a maximum range of 2,400 miles. These tanks were both filled at the top of the wings with emergency dump valves on the outside of the fuselage.

There was much more to be done and special equipment to obtain. Air-sea safety and rescue apparatus was necessary. The Navy's latest development, the Pararaft kits, were supplied each man. These consist of a one-man life raft, sunburn ointment, water de-salting set, emergency drinking water, three cans of rations, radar corner reflector, five dye markers, nylon line, solar still, A.P. daynite distress signals, instruction manual, signalling mirrors and a sponge.

The two also took along seat-pack para-

Stop-by-stop itinerary was painted on fuselage of the planes. Painter at bottom begins to letter the name "Los Angeles," first landing after returning to the States.

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chutes, nylon life vests, equipped with distress signals, dye markers and whistles, and wore Mark II exposure suits on over-water flights. In addition they had to find space for street clothing: a business suit, extra shoes, shirts and several changes of underclothes.

Still to come were various essential tools in each plane, a spare set of spark plugs and a compressed-air tire inflation bottle.

The Army and Navy required that they learn all about the safety and rescue equipment and pass rigid tests before they would be granted permission to take off. They also had to "bone up" on their navigation, lay out a flight plan, learn service facilities at each stop, study weather, become acquainted with their overloaded airplanes, and 101 other things. Their credit was established with the Esso Company and the credit cards came in at the last moment.

Finally they were ready to go. Their families met them at Teterboro Air Terminal on the morning of August 9. Their wives pinned two good-luck charms, gold Dutch shoes, on their flying suits and they waved goodbye. As the planes took off, they couldn't be distinguished one from the other, except that Evans' craft was christened "City of Washington (NX-2365M)" and Truman's, "City of the Angels (NX-3671M)."

After several hours on instruments, they landed at Presque Isle, Me., to check weather. Next day they flew to Goose Bay, Labrador, where they were delayed three days by bad weather. On August 13, the 750 miles to Bluie West One, Greenland, was covered in 8 hr. 35 min., despite constant headwinds. Both were taken ill with influenza, delaying their flight.

On August 24 the trip was resumed. Their destination was Meeks Field, Reykjavik, Iceland. They were on instruments all the way. Here disaster came close. Fog shrouded the island and they flew past but luckily discovered their error in time to turn back. Evans said that just one hour after they landed the airport was socked in by fog and clouds.

They headed for Prestwick, Scotland, on August 28, but landed at Newton Ards, Ireland, when they learned by radio that Prestwick was closed in. Two hours after refueling, they took off for Croydon Airport, London, where they were officially acclaimed. New York to London was 3,602 miles and required 42 flying hours.

They took off on August 30, via Brussels, Belgium, for Ypenburg, Holland. Truman had planned this detour in order to visit a Dutch family to whom the Trumans had been sending food and clothing since the war.

Their next stop was Paris, where, coming in for a landing at Orly Field on September 3, the tower operator remarked:

"Welcome to gay Paree!"

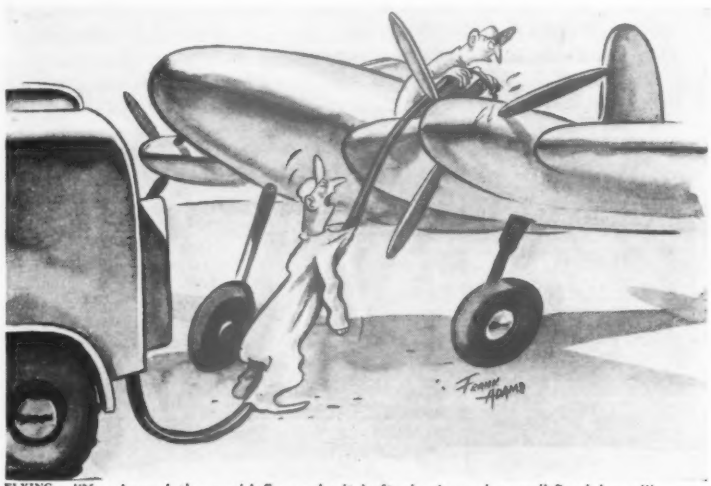
They were in Marseille two days later, but had to "sweat out" weather before they could take off for Ciampino Airfield, Rome, September 7.

The air road to Farouk Field, Cairo, measured 1,350 miles, 1,000 miles of it over water. They completed the flight at an average speed of 112 m.p.h. They took off on their 808-mile trip to Bagdad, Iraq, on September 11, and then turned southeastward to Dhahran, Saudi Arabia. They were detained by Arabian authorities for six days, although they held visas and advance flight permits.

Karachi, Pakistan, was the next stop and the 1,100-mile trip was covered in 9½ hours September 19. They went to Jodhpur, India, the next day and were guests at the Maharajah's palace. By September 24 they had landed at both Allahabad and Calcutta. They took off the next day and followed the coastline of the Bay of Bengal, crossed the jungles of Burma and finally reached Rangoon.

They were now half-way around the world and had been gone seven weeks.

Their 365-mile flight over the mountainous border between Burma and Siam was rugged and the small planes were severely buffeted by high winds and storms. They later touched at Bangkok and Hanoi, Indo-China, and on September 29 flew 558 miles to Hong Kong.



FLYING "You 'round the world flyers don't hafta be in such an all-fired hurry!"

Typhoons off the coast of South China held them up until October 5, when they left for Shanghai. On this trip they ran smack into 80 m.p.h. headwinds and were forced to make an emergency landing at Amoy, China. When they were hours overdue at Shanghai, a frantic search was about to begin for the "lost" airmen but was prevented when they were found safe at Amoy.

In the face of a 40-m.p.h. headwind, they took off October 9 for their 500-mile trip to Shanghai. They left that city October 13 for Fukuoka, Kyushu Island, 540 miles distant, and on October 18 landed at Komaki Air Base, Nagoya.

They flew to Haneda Airfield, Tokyo, on October 19, and were greeted by William Sebald, Chief of the American Diplomatic Section in Japan, and Lieut. Gen. Ennis C. Whitehead, commanding officer of the Far East Air Forces.

The 525-mile trip to Chitose Army Air Field in northern Japan was flown on October 24, and on October 27 they went to Nemuro Field, Hokkaido Island, where they were to face one of their toughest hops—to Shemya Island in the Aleutian chain.

This flight was started early on October 28 and was made in 13 hr. 35 min. flying time. Their planes carried full loads of 138 gallons of fuel each for the first time on the trip. The runway was rough. Take-off was at night. The weather was foul. The two small planes lifted off okay but the pilots went on instruments immediately. Ice conditions were extremely bad. To help them in this crossing a "mothering" *Flying Fortress* and officers of the Third Emergency Rescue Squadron flew protection and assisted in navigation across the north Pacific.

The sight of Shemya was "the prettiest thing we saw" on the long journey. A few moments later their wheels touched American soil for the first time in nearly three months.

They left Shemya October 31, still accompanied by the *Fortress* and a Navy *Catalina* from Adak, landing at Adak after covering the 400 miles in 3½ hours. On November 2, they flew 4 hr., 25 min. to Fort Randall at Cold Bay on the Alaskan mainland.

Snow, wind and general bad weather in Alaska began working against them in earnest. On November 3 they flew to Naknek and the next day started for Anchorage but were forced back when the weather suddenly worsened. They reached Anchorage the next day, then were delayed until November 11 in their flight to Big Delta.

They attempted to fly to Whitehorse, Y. T., November 12, but were forced by a snow storm to land at the Army base at Northway. For the next few days, when weather permitted, they managed hops to Fort St. John, B. C., Watson Lake, Y. T., Edmonton, Alta., and finally Lethbridge, Alta.

From Lethbridge, Cliff and George took off on November 26 on a 1,200-mile nonstop flight to Los Angeles, where they landed at Metropolitan Airport at 9 p.m. —Thanksgiving Day eve.

Eight more stops and 2,500 miles later they were home in Teterboro. END

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The Temco Swift

(Continued from page 39)

ually-cranked Roby (now Beech) propellers that added one serious fault to the airplane: they were propellers for 65-h.p. engines, not 85. Result was that the *Swift* had notoriously poor take-off performance as well.

All those factors added up to a distinctly less-than-perfect private plane. Pilots and owners had so much trouble with the 85-h.p. *Swift*, in fact, that most aviation insurance companies will no longer write policies on that model.

Such news travels fast, so it is understandable how the *Swift's* reputation became established. But to have that reputation automatically hung onto the present 125-h.p. model being produced by Temco (Texas Engineering and Manufacturing Co., Grand Prairie, Tex.) is unfair, and, as I learned after flying the airplane for this article, unjustified. Even before the Globe company had gone out of business the 125-h.p. model (technically the GC-1B) had been placed in production and the 85-h.p. version discontinued. Temco, which bought the *Swift* project from the defunct Globe company, is producing the 125-h.p. airplane exclusively.

After you have flown both models of the *Swift* you undoubtedly will arrive at the same conclusion I did: there never should have been an 85-h.p. version; the design surely must have been intended for the larger engine all along.

What have they done about those basic faults in the 85? The 125 has 30° of flap, instead of 40°, hence the glide has been flattened out considerably. The 125 has a steerable tail wheel, completely eliminating, so far as I could find, any ground-looping tendencies. The larger engine now turns an Aeromatic propeller that was designed for a full 125 horsepower.

It's amazing what four relatively simple changes have done for this airplane. Now that I've flown the 125, I'm convinced that this *Swift* is as gentle and forgiving an airplane as the 85 was tricky and troublesome. I tried everything that originally had worried me about the *Swift*, and each fear turned out to be a myth. The only faults I have to find with the 125 *Swift* are relatively minor. In all major respects I'm convinced the *Swift* now rates above the average.

The minor faults? First, it's noisy—one of the noisiest airplanes I've flown. But Harry Usselman, *Swift* factory dealer of East St. Louis, Ill., whose airplane (NC-3731K) I flew for this article, tells me there is no real sound-proofing in the airplane other than a small amount on the underside of the overhead metal hatch. Obviously, Temco should go over the whole airplane with a view toward soundproofing. A long cross-country flight in the present model would undoubtedly be a nerve-jarring experience.

Then there's the matter of visibility, something you usually don't have to complain about in a low-winged airplane. But this *Swift* now has a solid overhead metal hatch instead of the previous transparent hatch. Result is that the airplane has restricted overhead visibility, putting it somewhat in the class of a high-winged monoplane.

Another item: I personally would prefer to have some positive means of determining whether or not the landing gear is down. The present *Swift* has the same basic system of the 85-h.p. *Swift*: the customary operating switch (right next to the flap switch, although the handles on each can quickly be identified by feel alone), small gear-position lights (which only indicate that the gear is up or down), and the manual emergency crank between the seats.

In view of the fact that it's impossible to see the gear from the cabin, it seems to me that there should be some positive mechanical indicator accessible to the pilot that would always show the position of the wheels. When I flew the 85s I had the electrical system fail on one. Which meant that the indicator lights, flaps and landing gear all failed at the same time. I cranked the wheels down as far as I could turn the manual handle, but there was no way of making a positive check of the position of the wheels.

TEMCO SWIFT
Type Certificate No. 766
One 125-h.p. air-cooled Continental engine.

Wing span	29 ft. 4 in.
Length	20 ft. 10 in.
Height	6 ft. 2 in.
Gross weight (pounds)	1,710
Empty weight (pounds)	1,125
Wing loading (lbs./sq. ft.)	13
Fuel capacity (gallons)	26
Top speed (m.p.h.)	150
Cruising speed (m.p.h.)	140
Stalling speed (m.p.h.; with flaps)	43
Maximum range (miles)	420
Service ceiling (feet)	16,000
Rate of climb (f.p.m.)	1,000

Source: Texas Engineering and Manufacturing Corp.

Another thing missing from the *Swift*—and this could be remedied quickly—is a pilot's check list. Pilots can and do learn to fly airplanes without check lists, but that's doing it the hard—and unsafe—way. Check lists have saved many a life, and there is no reason why any airplane, particularly one with retractable gear, flaps and so on, cannot have one.

Otherwise, this is a highly acceptable two-place, high-performance personal plane. Loaded to within a few pounds of the maximum gross of 1,710 pounds I made several take-offs in 10 seconds, using a technique Usselman recommends: open the throttle wide, get the tail up and the ship rolling well, then snap on full flap. Usselman tells me he and the chief pilot of the Usselman Air Service school carefully measured the ship's take-off using that technique. With the plane fully loaded, and taking off in still air, they took the average of a number of take-offs—378 feet from a standing start. Which is as good as many lighter personal planes can do. The use of the flap in mid take-off appears to cause no difficulty; the indicated air speed stays between 70 and 80 m.p.h. as the flaps are dropped. Only reaction you must watch out for is the plane's tendency to dip its nose as the flap takes effect; the *Swift* pilot quickly learns to ease back the wheel as he operates the flap switch.

Rate of climb from the airport (642 feet above sea level) worked out to just under 1,000 f.p.m. Another climb from 3,442 feet above sea level to 4,442 feet worked out to 576 f.p.m. Best climbing air speed is between 75 and 80 m.p.h.

I made several stalls with this airplane, with flaps and landing gear both up and down. As closely as I could interpret the rather broad readings of the plane's instruments, they conformed closely to those claimed by the manufacturer. With flaps and gear up, the *Swift* stalled at about 50 m.p.h. indicated; with flaps and gear down, stalling speed was in the low 40's. In either condition the *Swift* is a very gentle and safe airplane to stall. As it approaches the stall the tail sets up a pronounced vibration that gives even the roughest private pilot plenty of advance warning. But if the wheel is held back beyond that warning, the airplane stalls quite gently and the nose settles straight ahead. Due to the large wing-tip slots, there always is plenty of aileron action, even when the *Swift* is completely stalled. Twice I popped the nose forward sharply as I stalled, in approved lightplane fashion. With the *Swift* the effect was to cause a secondary stall as the plane came back to level flight.

In level flight the *Swift* trims up easily and you rarely need use the rudder pedals after that. As a matter of fact, I suspect the airplane could be flown safely without rudder in all conditions except for making a cross-wind landing. I flew it cross-country, through normal maneuvers, including tight turns and stalls, all without my feet on the rudder pedals. And, incidentally, all the flying I did in this airplane was in the right-hand seat, not a good place for a pilot to get acquainted with an airplane.

The *Swift* is unusually sensitive on its controls. To fly the airplane properly the pilot must develop a soft, delicate, gentle touch. The difference between flying the *Swift* and the average lightplane is like the difference between the touch used in playing the violin and the bass fiddle. Despite the fact that I have flown *Swifts* a number of times, I still feel it would take me several hours of practice before I could learn to "think" the airplane through maneuvers, instead of mauling it.

This lightness of touch is particularly critical in the approach and landing. Once you get slowed up in the traffic pattern, get the wheels and flaps down and the glide established, it's best to avoid any undue movement of the controls. One trick that is useful in an approach is the use of the flap to lose unwanted altitude. While holding the glide steady, I found I could lose all the excess altitude I wanted simply by flipping the flap up and down; each time it is retracted the plane drops quite a bit.

But any pronounced control movement, particularly of the elevator, will cause the *Swift* to react instantly. Dur-

ing several landings I "flared" just as I would many other types of personal planes. I quickly learned better, though; the *Swift* hopped right back up in the air. To flare the *Swift* you have only to hold the elevator in that steady glide and, as the wheels approach the runway, move it gently and just a fraction of an inch. The *Swift* will literally land itself.

Maneuverability on the ground is excellent. I made several landings, and taxied quite a bit, all in a cross-wind. Yet it was never necessary to use brakes to maneuver. The steerable tail wheel takes excellent care of the *Swift* from the instant of touch-down right up to the parking area.

Altogether, the Temco *Swift* should be an excellent buy for the private pilot who uses a plane as a means of economical transportation. The standard model (fixed-pitch propeller, no radio) lists at $3,250 f.a.f., while the de luxe model, with Aeromatic propeller and General Electric radio, sells for $3,750. And the fact that it cruises in the vicinity of 140 m.p.h. and burns 8.6 gallons at cruising (2,375 r.p.m.) makes it an attractive cross-country airplane. The ratio between the *Swift's* cruising and stalling speeds, incidentally, is the highest of almost all the personal planes on the market today (3.26 to 1).

And this is not a "bargain-counter" airplane, either. The cockpit and instrument panel layout are among the most attractive available today. The cabin heater keeps the cabin warm enough for shirt sleeves, despite the fact that one of the sliding side windows might occasionally vibrate open a crack.

So if you are looking for an airplane with this kind of performance for the price, the *Swift* should be on your must-see list. Don't listen to the "anti" gossip; go see for yourself. You'll find that you *can* get insurance on this airplane, although the requirements of the insurance companies are a bit more strict than they are for standard lightplanes. This, however, is not peculiar to the *Swift* alone. The *Swift* is in a class of airplanes that includes the *Bonanza* and *Navion* (retractable gear, controllable prop, etc.) and therefore requires a bit more pilot skill "to work the gadgets."

MAX KARANT

This Is Private Flying

(*Continued from page* 18)

was charged, so obviously a lot of important inspections were overlooked. I got what I paid for, but not what I asked for. All applicable operations listed on the Government's Form 319 were checked off as having been done, though I know positively that many were not.

After leaving the Luscombe factory at Dallas, my first stop for maintenance was at Abilene, Tex. As I taxied up to the gas pump at the municipal airport, I opened the primer, let the engine load up and quit. I went into the maintenance office and asked them to check the idling. A mechanic said it was too late in the day to start on my ship, but that they would adjust the carburetor in the morning before I left. I left the primer handle out.

Next morning I arrived at the field to find the same mechanic in the back of the large hangar, spraying the fuselage of a PT-19 that had just been recovered. He was lying on his back with a lighted cigarette in his mouth. The hangar had 11 planes in it and was full of highly-inflammable dope dust. No fire-extinguishing equipment could have saved those planes had that dust exploded.

I looked inside my Luscombe and noted that the primer had been locked. The mechanic told me he thought the carburetor float level was too high, and that he had reset the mixture and increased the idling speed. He had, all right; the engine idled at about 750 r.p.m. (normal is 550 to 600). I was charged $1 for that work, a reasonable figure.

Next maintenance stop was Big Spring, Tex. Again, I pulled out the primer as I taxied in; the engine sounded like a tumbling pail of loose bolts, and black smoke was pouring out the exhaust. I left the primer out and asked the line boy to get a mechanic to check the engine. No mechanic had appeared 25 minutes later, so I went to the manager's office and asked again for a mechanic. He phoned someone and two mechanics drove up within a few minutes. They went to work on the ship while I stood in front and watched. One climbed in and started the engine while the other watched. He ran it up,

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then throttled back. It idled satisfactorily, indicating to me that he had found the open primer and closed it. The second mechanic opened the cowl, tinkered with something I couldn't see, then closed it. The first mechanic then shut off the engine and indicated the job was done. Here again I was charged $1.

At Wink, Tex., I opened the cowl ostensibly to check the oil while a line boy was gassing the ship. When I was sure he couldn't see it, I pulled one plug wire off its plug, then closed the cowl. I went over to check the weather, and returned to find that there were no mechanics on the field. The office girl didn't know where or how I could get a mechanic so I had to replace the wire and leave. Had there been a mechanic available, I would have left the wire off, taxied out, and then suddenly "discovered" the rough engine.

El Paso was next. As soon as I landed I told the line boy I thought I had a rough magneto. When he left to get a mechanic, I opened the cowl and again pulled that wire loose. The boy returned to say that most of the mechanics were off on Saturday afternoons (I landed about 4 p.m.), but that the Sunday man would check it first thing in the morning. Meanwhile, I asked them to wash the plane; excess oil put on the control hinges at the factory had blown back across the control surfaces in streaks, collecting dirt and sand.

When I got to the field the next morning, a mechanic had just finished working on the Luscombe. He said the plugs were all loose (though we had checked them carefully at the factory with a torque wrench) and that he had cleaned, adjusted and replaced the plugs. He also said he had checked and retimed the magnetos. I then looked at the engine to check the magnetos myself. First, I could see no indication on the magneto nuts that they had been moved; dust and oil always collects on these nuts and wrench marks will show, though these were still covered with oil and dust. In running the engine, I could tell no difference in its performance. I was charged $4.50 for this work. There was no mention of the loose plug wire which he obviously had replaced. The wash job, meanwhile, had not been done.

As a matter of fact, among those mechanics who did find that loose plug wire, not one suggested that it be safetied so as to make sure it wouldn't fall off again. This despite the fact that it is a common practice among operators to safety the plug wires of their own airplanes.

Going into Tucson, I had the first and only real trouble with the Luscombe. I had just passed Cochise, Ariz., when the engine suddenly roughened up and started to vibrate. I thought it was carburetor ice, so pulled the heat control. The engine almost stopped, so I quickly pushed the heat control in and opened the throttle wide. The engine picked up to a maximum of 2,200 r.p.m. (normal cruise is 2,350). I had to keep the throttle wide open all the way into Tucson. I raced a storm into the airport and pulled the throttle back only when I was almost on the ground. The surface wind, meanwhile, was between 25 and 30 m.p.h. and it had started to rain. I tried opening the primer to keep the engine going, and it seemed to work.

I taxied along a runway until a car with five or six men came out on the field to help me. They held onto the wings while I taxied in to the hangar. Before stopping the engine I checked the mags and found no variation in either. Shutting it off, I then asked the line boy to get a mechanic. He went into a little shop and returned in a few minutes saying that the mechanic had heard the engine as I taxied by, and that it was only wet. I then went in and told him the engine had been acting that way about 30 miles back, where I'd been flying in bright sunshine. He then decided it must be plugs, and proceeded to pull all of them. I inspected each plug as it came out and saw nothing wrong with them.

Nevertheless, he sand-blasted them, checked the gaps, and replaced them. Meanwhile, I went to another office to check my weather ahead. When I returned he was running up the engine, using the primer to keep it going. He then told me my right mag was dead, but that he had no more time to work on it. He turned me over to another mechanic from a different operator on the field, refusing, meanwhile, to charge me for any of his work even though I asked for a bill.

This second mechanic is the man I referred to earlier, who also refused to charge me for any of his time because he discovered that he had overlooked the crossed plug wires, which a good mechanic should have found quickly. He discovered the real trouble after he had removed the cowl and propeller and was checking the carburetor. He discovered the plug in the intake manifold had fallen out. The half-inch hole this left in the induction system had leaned out the mixture, causing the engine to malfunction.

After putting in a new plug and replacing the propeller, he found the engine ran normally on the left mag but that the right mag was dead. It was here that he made the mistake for which he later refused payment. He removed the mag and disassembled it, though he should have checked the plug wires first.

By the time he had discovered his mistake and fixed the engine, he and his helper had spent over eight hours on the Luscombe. By that time it was too late to go on, so I got a hotel room in Tucson for the night. Next morning he said he would not charge me anything. But I insisted on paying him, so he charged me only for six hours of his helper's time. The total bill came to $12.50. Had he not admitted his mistake, he could legally have charged me over $40.

I was in Phoenix in time for lunch that day. I taxied over to a line of parked planes, opened the cowl and pulled loose another plug wire. Then I walked into an office nearby and asked for a mechanic. I was told to taxi my plane down to the other end of the field—nearly a half mile. There the mechanic started checking and immediately found the loose wire. He told me about it, then pointed out that the left mag showed more of a drop than the right. He pointed out that the engine was beginning to loosen up and leak oil, and suggested tightening all nuts, bolts and screws.

I told him to fix the left mag. He then pointed out that the right mag, which had been worked on at Tucson, was loose and improperly set. This despite the fact that I had myself watched the Tucson mechanic tighten and check all the magneto nuts before replacing the cowl. Next morning the airplane performed just as it had before I arrived at Phoenix. They charged me for 1½ hours of labor.

No further maintenance work was done on the Luscombe until I reached Los

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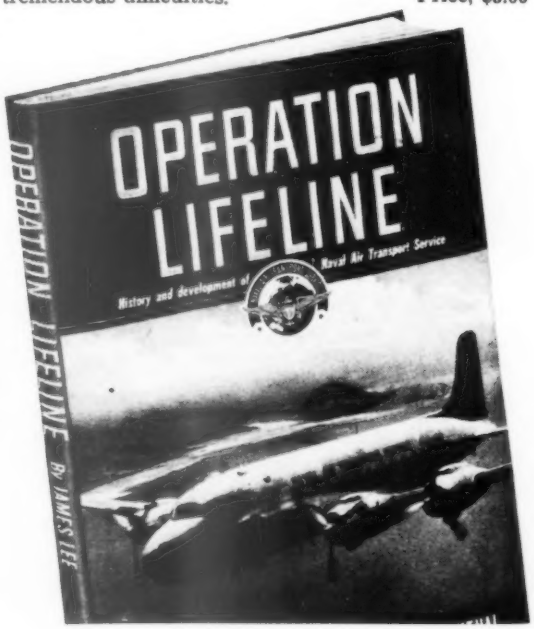

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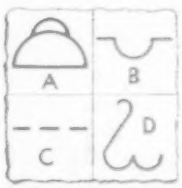
Angeles. I did stop at a San Diego airport before heading north. I had no maintenance work done there, for a reason. As I taxied up to the line I noticed a Taylorcraft standing out in the open. It was being sprayed while another mechanic was working on the stripped-down engine. As I came to a stop, a BT-13 taxied by, blowing a tremendous cloud of dust over me and the Taylorcraft. The latter disappeared in the cloud for a few seconds; when the dust cleared, the mechanics were still spraying and working on the open engine as though that amount of dust couldn't possibly do any harm to the finely machined parts of the airplane's power plant.

That evening I landed at a small airport on the outskirts of Los Angeles. I knew now that I was going to be busy; the Los Angeles area has long been a sore spot among private flyers and plane owners. What happened to me there and on up along the west coast as far north as Tacoma will be the subject of next month's article. END

DO YOU KNOW..?

TEST your aviation I.Q. with this quiz by G. Sidney Stanton of the Civil Aeronautics Administration. Here's how to score yourself: 100 per cent and you're an airline pilot; 90 per cent and you're a flight instructor; 80 per cent, commercial pilot; 70 per cent, private pilot; 60 per cent, student pilot; 50 per cent or less, you're a Dilbert.

A PILOT can predict flight conditions by noting the cloud symbols appearing on a weather map. What conditions are generally associated with each of the following symbols?



1. Unlimited ceiling and visibility, with smooth flying (a), (b), (c), (d)?

2. High ceiling, excellent visibility with strong up and down currents (a), (b), (c), (d)?

3. Low ceiling and smooth flying (a), (b), (c), (d)?

4. Low ceiling, poor visibility, and rough flying (a), (b), (c), (d)?

5. In addition to the airplane identification symbols NC, NX, and NR, a new symbol NL is now used to identify an airplane (a) of foreign registry, (b) in transit to a foreign country, (c) restricted against commercial use, (d) belonging to the United States Government?

6. Flight conducted when weather conditions are "CAVU" is known as (a) visual flight, (b) contact flight, (c) instrument flight, (d) dead reckoning?

7. If the distance between A and B on a Sectional Aeronautical Chart measures eight inches, the actual distance is (a) 32 miles, (b) 64 miles, (c) 128 miles, (d) 320 miles?

8. In tying down a light plane outside a hangar in a high wind, it is considered safer to place the plane (a) 45° into the wind, (b) nose into the wind, (c) tail into the wind, (d) directly cross wind?

9. A pilot plans to make a 1,000-mile flight with a stopover of 20 minutes at the end of each hour of flight. He plans

to arrive at his destination in exactly five hours. The total stopover time en route will be (a) 60 minutes, (b) 80 minutes, (c) 100 minutes, (d) 120 minutes?

10. "Swinging the compass" is a term which means (a) adjusting the compass so that it is aligned with the longitudinal axis of the airplane, (b) flying the plane in a complete circle to ascertain that the compass swings freely throughout the entire 360°, (c) tilting the wings to the right and left to ascertain that the liquid in the compass is at the proper level, (d) determining the correction which must be applied to compass reading in order to obtain greatest accuracy?

ANSWERS ON PAGE 77

Helicamera

(*Continued from page* 35)

Another scene was a chase in an automobile. From the air the motion picture cameraman filmed the pursued men getting into the car and then followed them along the highway as they made their getaway. The helicopter turned with them as they made sharp, right-angle turns, and followed them out to a straightaway. As the car raced along the highway, the helicopter gradually overtook it. Using a telescopic lens, the cameraman, while the helicopter closed the gap, brought the action right into the back seat of the automobile. Realism and speed of motion has never before been depicted like this.

Use of the helicopter here saved time which, translated into pay for actors and crewmen, is a costly item. It eliminated, for example, the necessity of using extra cameras and camera cars, and of transporting heavy camera cranes and other equipment to location sites.

Credit for the development of the 'copter-camera goes to Robert S. Williams, a former studio publicity man.

While serving as a flight instructor at Cal-Aero Academy in Ontario, Calif., during the war, Williams was lecturing on aerodynamics, explaining lift and the need of forward velocity of a standard airplane to sustain height. This is not true with a helicopter, he remarked. And the idea to mount a camera on helicopters for motion picture work suddenly hit him.

Williams envisioned the helicopter as an "almost infinite camera boom," capable of doing close-ups, long shots, moving scenes and even hovering shots without pause and with only one camera instead of half a dozen placed on the ground.

After being released from the service, Williams sought the help of two specialists, Paul Ivano, veteran Hollywood cinematographer and World War I pilot, and Knute Flint, co-owner of Armstrong-Flint and World War II 'copter pilot with the Air-Sea Rescue Unit.

Eight months of experimentation followed. One major problem was to prevent the craft's vibration from setting up "sympathetic shakes" in the camera.

The three sought the aid of Ralph Densmore, camera expert of the Mark Armistead Camera Shops, Hollywood, who designed and built a shockproof mount. A special steel tube mount was bolted to the door frame, with pongee cord and rubber mats placed in key spots. This, along with other innovations which Williams guards as a trade secret, virtually eliminated vibration in the camera.

The next problem was balance. This was solved by placing an outrigger on the helicopter's side opposite the camera mount. This consists of an aluminum beam extending to a box loaded with buckshot and sand.

The cameraman has the difficult job of operating the camera while half out of the plane. He uses an extended seat belt and also supports himself with a special rope sling in which he places his right

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foot outside the craft in order to peer into the view finder.

The camera has 180° panning action and the same for elevation and depression. It is equipped with a two-inch lens and is "stopped down" to infinity in order that the scene will be in focus at all times. To save weight, the 35-mm. Mitchell camera was equipped with a 400-foot film magazine instead of the usual 1,000-foot container.

Film for preliminary experiments was donated by the Research Council of the Motion Picture Industry and DuPont Film Company.

Then came the job of teaching Flint, the pilot, the specialized subject of cinematography. Ivano, the cameraman, could, of course, follow the scene of action in his camera view finder, but much of the time the action was obscured from Flint's view.

So the two devised a set of hand signals. Certain hand movements by Ivano would direct the helicopter's flight—slow, fast, hover, sideways, higher, lower, etc.

Flint's job was most exacting. He had to keep his craft flying as smooth as possible to prevent "camera movement." And even today, according to Flint, "it's the most painstaking job of flying I've ever had to do."

He invariably is faced with the problem of holding the craft smoothly when there is even a light breeze. And try holding a helicopter in a steady, hovering position downwind sometime! Flint also studies terrain and wind to gain altitudes and to combat breezes.

Air-ground communications are via huge signal panels. A black and yellow one is used to start a shot and a red and white one for halting a sequence. Two-way radio will come later but now the equipment is considered too heavy.

Before each flight both Ivano and Flint are carefully briefed by the director. When they know how long the scene will take they fuel the craft with only enough gas to make the shot and for a few extra minutes as a safety measure. This saves weight. Often, too, if the film is to be made near the ground, crews must sprinkle the dirt with water to prevent the helicopter's rotors from raising a dust cloud.

After all shooting, the dialogue must be dubbed in. Sound would be destroyed by the craft's engine and rotors.

The camera-carrying craft can operate efficiently up to 3,200 feet but to date a 1,200-foot altitude has been sufficient. Best stability is when ground temperature is around 70° and there is little or no breeze.

To keep the helicopter in perfect trim and to cut down vibration as much as possible, the Armstrong-Flint Company has two expert mechanics, Arthur Miner and Vernon Dunn, former Bell company technicians, with the craft at all times when films are being made.

The 'copter-camera was used extensively in the filming of "Johnny Belinda," a Warner Bros. production, and late in the year was also being used by Columbia Studios, Paramount Pictures and Universal Studios. END

The MAD Prospectors

(*Continued from page* 30)

human minds and hands are fallible, mechanized forms of recording the flight path and the magnetometer readings were necessary.

It was a simple matter to install a time and magnetic-variation printer. For recording the flight path, the engineers decided to use cameras. A special split-field camera, the exposures of which were timed to the movement of the plane, was developed. A mirror set up in view of the lens reflects a serial number from the face of the magnetometer plus all the significant settings of the device. These were recorded on the exposure, thus making a double record of the magnetometer readings.

When the geophysicists moved into northern Alaska last summer to survey the area for the Director of Naval Petroleum Reserves, they took a new camera which allowed a continuous exposure of 800 miles while flying at 1,000 feet. The engineers estimated that a single roll could film one stretch of land from one coast of the United States to the other, provided the exposure was made at 4,000 feet.

The survey in Alaska was the first large-scale commercial enterprise which the magnetometer survey company had conducted. Because of the secrecy which the hard-pressed Navy imposes on all hunts for oil, Jensen and his associates are not able to say what they discovered. The Navy and Jensen alike report the investigation was "successful."

About April 1, Aero Service Corp. undertook what is probably the largest geophysical exploration of any type. The area to be covered was more than 50,000 square miles surrounding the Bahama Islands. Five large petroleum firms, including Gulf, Standard, Shell, Superior and Anglo-Iranian, contracted for the expedition.

Most of the area covered is over water. This naturally rules out the use of a camera to record the flight path. Instead, Jensen and his crew have chosen the wartime-developed Shoran navigation aid. Shoran stands for Short-Range Navigation.

Shoran guided bombers assigned to giving close support to advancing ground troops during the war. In Europe, where it was used most extensively, Shoran proved to be a most exact instrument.

Aero Service has placed four Shoran stations aboard ships which will be stationed at points in the Bahama area. In flying the pre-determined flight paths, the DC-3 which the geophysicists are using is guided in an arc, the circular flight path is necessary because of the peculiarities of Shoran.

One of the four stations will be set up as a drift station, the other three as rate stations. Micro-wave impulses will be transmitted from the plane to the drift station and rebroadcast to the aircraft. The "reflected" impulse actuates electronic devices in the plane which determine the distance between the plane and

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the rate station. It also actuates a pilot direction indicator which enables the pilot to fly an arc of constant radius and indicates any deviation from the desired course. A record tape attached to the indicator notes any deviations from the flight path.

Additional electronic devices in the plane interpret the trasmission of the rate station into distance evaluations of even miles. These distances are recorded on the same tape used in recording the drift station distance.

Thus the DC-3's position can be fixed at any moment by the intersecting radii of the drift and rate station. It's a simple problem of triangulation.

In addition to the record of the flight horizontally, a device has been installed in the DC-3 to record the vertical flight for any variations in prescribed altitude. This device is a combination of a radio-altimeter and the recording milliammeter used in making the Shoran record.

Ground work of the project, aside from manning the Shoran stations and maintenance of the airplane, calls for interpreting the readings of the magnetometer record and drawing a magnetic contour map of the area. Only from the contour pattern can accurate positioning of the deposits—if there are any—be made.

Including the plane crew, boat crews, ground technicians and geophysicists the Bahama operation will employ about 50 men. Time extension of the survey will be dependent on flying conditions and maintenance of the aircraft.

The airborne type of geophysical survey has proved only half as expensive as the old ground manner and is much more accurate for positioning. For these reasons it is likely that the MAD will see quite a demand for its services as the search for oil grows more intense.

It may well come to pass that the Magnetic Airborne Detector, born as an inauspicious war-baby of the Bell Telephone Laboratory, will grow into the savior of oil and all the oil-dependent industries of the world—not the least of which is the airplane. END

Report from Washington

(*Continued from page 42*)

town, Md., where it was built, to have a look.

Lightplane Sales

With all figures not yet in, the Aircraft Industries Association recently predicted that a total of "more than 15,000" new planes went to lightplane customers in 1947. This represents a total pilot expenditure, in terms of the manufacturer's net billing price, of nearly $50,000,000. Total number of new lightplanes sold in 1946 was 33,500, but AIA thinks the 1947 figure not bad in light of the beating that aviation took during the year. Nor is the Association pessimistic about the coming year. "It may not be as good as last," said one spokesman, "but at least we're facing it without rose-colored glasses and with supreme confidence in the ultimate widespread use of planes for all kinds of transport by all kinds of people."

ICAO Trouble?

ICAO, the international rule-making body for aviation, for some time has been writing regs like crazy to govern international flying. Last year, private flying didn't pay this much heed on the assumption that the rules dealt mostly with air transport and that they had nothing to do with the average U. S. pilot so long as he kept U.S. land under him. But is this true? Is it possible that rules made by ICAO will be brought back by the U. S. delegates and domesticated on the grounds that since U. S. has agreed to them abroad they'll have to be obeyed at home?

Silly as this may seem, it is worth considering seriously, for so far nobody has been able to get a Government official to deny that this will be done. And a number of Government officials, including some who worked on revising Part 60 of the Civil Aeronautics Board regs, others interested in bigger and tougher pilot licensing, and still others thumping the tub for more medical bureaucracy for the lightplane pilot—more than a few of the red-tape boys have been asking for ICAO rules on the home front. If this happened, lightplane flyers will be put under rules which they have had no chance to okay. More ironic, they are rules written by nearly four-score nations against the U. S., although this country has more light aircraft than all the rest of the ICAO members combined.

Leading the campaign to get a straight answer from our representatives is J. B. Hartranft, Jr., general manager of the Aircraft Owners and Pilots Association, who sees in the ICAO trend a real danger to private pilots in this country. He recently asked the State Department if it is true that they are going to try to saddle domestic U. S. flying with ICAO rules. State passed the buck to the Air Coordinating Committee, top Federal air policy group. ACC turned it over to their legal committee. Legal, as this goes to press, has said nothing either way.

The rules continue to pile up and many U. S. delegates to ICAO, every time they come home, urge that they be adopted here. If they continue this policy during the coming year, and no official stand is forthcoming, it may lead to one of the top controversies of 1948, with the lightplane pilot, as usual, in line for a beating.

Pilot I.Q.

If you are a pilot maybe you're not so dumb after all, in spite of what some of the experts may say. A recent CAA survey among fixed base operators shows that many a GI, whose record indicates that he had trouble getting through grade school or flunked out, is doing likewise consistently with his ground school tests. The boys have a right to get the training and the operators love them for the revenue they bring. When they flunk, everybody is embarrassed one way or another. Still others, some operators report, are irresponsible or won't concentrate, owing to job or girl trouble. But

the reports indicate that only the bright ones make the grade.

Test Book

Speaking of tests, CAA is bringing out a guidebook on how to take them, complete with suggestions for texts and sample questions. The volume was prepared by the examination section of CAA to help pilots bone for commercial written exams. When you plan to take the test, you might find the booklet interesting reading and the questions fun. Here's one Civil Air Regulations question, just to give you an idea:

You are a commercial pilot flying a plane with three passengers—the registered owner of the plane, a CAA inspector, and an airline transport pilot. While you are in the air a violent storm comes up and a difference of opinion arises concerning the most advisable procedure to follow. Final decision rests with (a) the owner, (b) the CAA inspector, (c) the airline pilot, or (d) you. (Ans. You, you dope, don't let 'em push you around.) The book is due out any day now and will be on sale at CAA or the Government Printing Office. We saw it in ms., when a price hadn't been set for it, but we are assured that it will sell reasonably.

Airports

Another matter cooking on the front of the CAA stove is building airports under a revised program—money from Congress permitting. CAA has just completed a national study of the airport situation, down to the last village in the remotest part of the country. With 4,431 ports already proposed, the Administration is now revising and expanding its plan which calls for work to continue this year, next, and through 1950. All figures were not tabulated as we went to press, but it is understood that the new proposals will recommend about 1,000 more fields than are now on the schedule, with the accent on lightplane havens.

Backwards Pilot

Propeller division of Curtiss-Wright is bragging these days about their chief test pilot, Herbert O. Fisher. Recently he took up a Douglas *Skymaster* at Caldwell (N. J.) airport and for the first time on record in aviation history reversed all four props while in flight. The effect, in a way of speaking, was to throw the plane into reverse, but what actually happened only Mr. Fisher knows, and he's refused to talk. All he's said so far is that he was at 15,000 feet when he turned the trick, cruising along at 150 m.p.h.

Obviously, things worked out all right. Curtiss-Wright is not the only one interested in the experiment—if four-prop braking can be done without danger other dangers may be wiped out of transport flying since speeds could be reduced to near-zero and landings made much more quickly in an emergency. Whether Fisher actually backed up—it can be done with reverse prop on the ground—is not known. He won't even say whether he stood still. But he does admit that his speed was cut to the bone. END

I Learned About . . .

(*Continued from page* 46)

We took off, my ship on the right hand tow. To one side and slightly ahead I could see the other glider's green starboard running light and his white tail light. I could see, ahead, the tow plane's tail lamp. But that was all. It was a terribly black night.

The tow out and back was uneventful, except for a little rough air. Back near the field we circled, awaiting our cut signal. Suddenly I noticed the lights of the other glider drifting in close—too close for safety. I swung out, and the lights ebbed away.

But the other motorless craft slid back toward me, out of position again. I had to dodge more quickly, this time with a couple of pungent remarks about "any so-and-so who can't stay in blankety-blank formation . . ." We started a tight turn to port, and the other glider skidded until its tail light was almost at 11 o'clock. Just as if its pilot couldn't see my ship at all.

"Maybe that's it," I realized. "The lights in my glider must not be working!"

Feverishly I swivel-necked, but there was no way of check-

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ing the navigation lights visually. All were hidden from direct vision.

So I fumbled for the switch, low on the right side of the cockpit, snapping it in and out a number of times, rapidly. Then I realized, not a little nervously, that I didn't know which was the "ON" position and which was the "OFF" setting. There was no cockpit lamp and I didn't have a flashlight or matches. No way of reading the printed legend over the switch.

But I did feel sure I hadn't changed the switch since take-off, and the lights had been on then. Vibration I ruled out, since the switch was stiff. So I pushed the switch in, to the position I had found it a moment before.

My best conclusion, in my flustered condition was that the wiring had gone bad. I settled back to keep out of the way of the other glider, which still was behaving strangely.

That turned out to be a job. The air was getting rougher and the towship was making tighter and faster turns. On top of that, ground control delayed our cut-off signal. I put in 40 minutes of fancy dodging before the welcome green flash came from that "biscuit gun."

I landed by the flare path, rolled up to the line, and opened the canopy. My instructor loomed up and, before I could speak, reached inside and grasped the offending switch. He pulled the switch to the "out" position. The navigation lights snapped on, bright as ever. My instructor glowered.

"I knew it!" he growled. "Kicked it off with your knee!" He gave me a look that said plainly I was the most stupid dodo in flying history. I felt he was right. Then he strode off, snorting.

My face was redder than the port wing light. And I realized, too, that my carelessness could have had serious, even fatal, results. My glider had been blacked-out for three-quarters of an hour and the pilot of the other TG-6 saw mine, dimly, only at intervals during that time, he said later. Had I taken a few seconds to make sure I knew how the switch operated it never would have occurred.

So I learned about flying from that! Since then I have never left the ground in an unfamiliar craft without first running through an impromptu, but complete, cockpit drill. I make sure I can operate, with my eyes shut, every control. And a couple of times, brothers, it has paid off. END

Are Flight Tests Useless?

(Continued from page 36)

found to be rough, nervous, and lacking in feel. To have denied this man his rating would also have denied him a means of livelihood. The inspector conscientiously recommended that he practice again on the more difficult maneuvers. At length the applicant brought himself up to par and the inspector again reluctantly wrote out a rating.

What should he have done? Should he have referred the applicants to another inspector? Revised the flight test? Selected better maneuvers? Or heeded the pleas of the applicants, docily writing out their tickets despite their failures? Or should he have firmly said, "NO!" thereby saving both applicants from fatal plane crashes only two years later?

The applicants, of course, were convinced they could fly. So are almost all wash-outs. It has been said that 99 per cent of all military service washouts are convinced they can fly and that most of them get into private flying later. On the other hand, over 30 per cent of the finely-selected and flight-tested service graduates eventually become the victims of their own poor judgment. Who is to blame? The inspector? Our soft, smug, and rotten times and customs? The flight test, which tests nothing but routine maneuvers and which give little clue as to pilot competence?

Or could the blame be placed on our system, which does not require a flight check once a flyer has soloed or has been rated? If it is the latter, let it be stated here and now that the trend is away from tests and high standards, not toward it. Private pilots no longer need study aerology, general servicing and operation of aircraft, or navigation for their written examination. Recently a move was thwarted by old-time pilots in Safety Regulation of CAA (derisively called the "Old Guard" by the money-mad interests and the crack-pot psychologists) to take every instrument out of the cockpit of the private plane! And this as a move to promote "flying for everyone."

It is useless to point out that in the present stage of flying such a trend will benefit no group as much as it will the morticians. It should be perfectly apparent to any student of history that the automobile, which killed more persons during the war than did actual combat, is operated by persons who have been inadequately tested. In some states, such as California, a comprehensive written test, an eye examination, and a road test are prerequisites for a driver's license. And yet the insurance rate for automobile collision is higher in the west than anywhere in the country!

If there is any correlation between testing an operator and his operating record, it would seem to point out that operational tests are useless. Take our present flight tests.

The flight test for a private pilot rating consists of a written exam on Civil Air Regulations and a short flight test on stalls, spin recovery, steep turns, pylon eights, and accuracy landings. But —and mark this—the very maneuver which gives the examiner even a minor clue as to the pilot's judgment (emergency landings) has been nullified *because the examiner cannot fail the applicant on this maneuver!*

Once again, in all fairness to the men in CAA Safety Regulation, let it be said that this amendment to CAR was passed almost over their dead bodies.

"What does an emergency landing prove?" asked the experts with 200 hours. One man proposed to do away with spins and stalls in flight tests because: "In practicing spins I failed to recover and killed my passenger and seriously injured myself; they are dangerous." "A

pilot doesn't have forced landings these days, so why fail a student on the maneuver?" The result was that during the war, when many of the inspectors were in the services, this and other regulations were forced through.

On the other hand, just what does it prove if a pilot can execute a simulated emergency landing? Or to make the question pithier, just what does any test prove? Take a Scheduled Airline Transport Rating, for example: For SATR a pilot must prove his ability to *maneuver the airplane,* work an instrument approach problem, and handle two or more engines competently. Yet there is not a single maneuver that gives the inspector any clue as to what the pilot would do in an emergency.

What is even worse, no inspector can fail an applicant who passes all the required maneuvers but who is known to be a dangerous pilot! No inspector can "lift" a ticket on demand—or, if he does, he is liable for suit and the courts are sure to find him guilty and assess damages. And to add to all this, the present attitude of the Civil Aeronautics Board is that of our national softness: let the miscreant off with a reprimand or small penalty.

To be sure, Government follows the trend and the demand. If conditions are what they are, then we, the people, have asked for it. No group is more pusillanimous than Washington bureaucrats and they sway like the willow when the wind of popular demand roars by their ears.

That fact, however, does not help the present situation. We have just gone through a flurry of accidents, both in scheduled airlines and in private flying. Statistics show that flying is "safe", that more miles per passenger are flown with safety than ever before, that the private plane is safer, and that one's chances of a safe flight are better than during the past decade. But that is slim, dim consolation when one finds that he has drawn a losing number and is involved in a dumb mistake like undershooting or overshooting an airport, or in taking instruction from some misfit who should never have had a rating in the first place.

The problem is not easy. We must concede the necessity of a test: it gives a student something to shoot for, and it raises proficiency to a certain, minimum standard. But a test must be validated, which simply means that the passers of the test must prove to be successful pilots! If every pilot who fails a certain maneuver eventually cracks up, then that maneuver is a valid test.

Fortunately, CAA is now completing a filing record of all pilots, their records, and their examinations. It will be easy to run the records through an IBM machine, tabulate the results, and find out which maneuvers really test flying skill.

Second, we must check on pilot aptitude and headwork. So far, none has been accepted; for example, the simulated emergency landing was the only maneuver that gave an inspector any clue whatsoever of a pilot's headwork. Yet this test was emasculated by the rule that, while it may be given on a flight test, failure on the maneuver may not be used as a basis for failure of the entire examination the student is undergoing.

Third, we must have some method of making decisions stick. Present regulations permit an applicant to reapply as often as he please, even if practice perfects him mechanically (as it did the elderly woman applicant described above). This may call for a temporary license which expires unless a regular flight check is taken at stipulated intervals.

Even this will not provide a test for headwork. It will only insure that technique is maintained. However, a poor test is better than none provided we continually try to raise standards and improve our testing ability.

Finally, we need firmer, stronger policy with regard to the revocation of certificates. After a pilot has flown for some time, his record should be examined. This is really a flight test—the acid test, as it were. Pilots who fly for years with a good or perfect record are better bets than a person who is continually a feature performer in a CAB accident report.

To summarize: Although they do set a minimum standard of technique, present flight tests are useless in testing pilot judgment or safety in flight. It is almost impossible to devise either a written or practical pilot examination that will give an inspector sufficient grounds or basis for the refusal of a certificate. The military services have tried for years to eliminate dangerous or inept pilots from their cadets, both by psychological, biographical, mechanical comprehensive, and flight tests. So far these efforts have been only partially successful.

We need better tests, with maneuvers that emphasize headwork, and we need regulations that will permit a follow-up flight test when a pilot's record indicates this is in order. We need firmer, stricter enforcement of rules, regulations, and routine checks on pilot aptitude. Such a flight testing program could be valid, valuable, and useful in making aviation the antithesis of the automobile—and it is not yet too late to accomplish it. END

Answers to Do You Know? on Page 70

1. (d) Cirrocumulus clouds at altitudes of 20,000 feet or more.
2. (a) Large cumulus clouds formed by severe upcurrents.
3. (b) Stratus clouds, sheetlike, in layers.
4. (c) Low, broken clouds of bad weather.
5. (c) The symbol NL is used for certain military surplus planes which have been sold to private owners or companies but may not be used to carry passengers for pay or for any activity that could be construed as "commercializing" upon their use.
6. (a) CAVU means "ceiling and visibility unlimited." Under the new Civil Air Regulations which were effective October 8, 1947, flight under these conditions is called "visual flight." It was formerly called "contact flight."
7. (b) The scale of the Sectional Chart is eight miles to the inch.
8. (c) If the nose is into the wind the plane may develop a dangerous amount of lift; if one wing is into the wind it may break the rope and tip the plane over, or bend the spars or struts. When the tail is into the wind the control surfaces should be locked with suitable gust locks.
9. (a)
10. (d) In swinging the compass the airplane is flown, or turned on the ground, on predetermined headings, and the amount of deviation on each heading is recorded on a deviation card.

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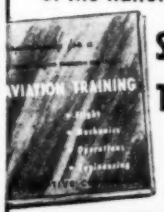

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Nogales: Arizona's Borderland

(*Continued from page 40*)

place from which to make side trips, and a gateway to Mexico.

To the perennial question—isn't Arizona a mountainous, desert country that the average flyer ought to stay away from?—Nogales citizens answer emphatically no! Arizona is a big state, so big there's room for all the New England states and a couple more eastern states in addition to be placed within its area. Four different sectional charts are needed to cover it. However, it contains much range land (cattle raising is big business) and the southern part, for all the brown tints on sectionals, is quite low, mainly from 2,000 to 5,000 feet. The numerous mountain ranges are actually more or less individual mountains rising from flat country.

During winter months the temperature in Nogales averages 45° to 50° and, since most Arizona airports have long runways, take-off and climb problems are no worse than on a hot day at sea level. Weather is unusually clear, with an average of 318 clear, sunny days annually.

In spite of its large size Arizona has a small population: 640,000. Flying tourists would do well, therefore, to follow railroads, main highways and populated sections, rather than wander out over the open country. It is also a good idea to file flight plans. Other than observing these common-sense precautions, there is little out of the ordinary in visiting Arizona by air.

Located in Santa Cruz County, Nogales is within a 30-mile radius of many of the west's chief tourist attractions—the dude ranches. Ranches are adapted to all wallets and tastes, have such popular activities as riding, informal rodeos, barbecues and pack trips. Most rates are $10 to $12 per day, including horse rental. Weekly rates average around $75. Twenty miles ENE of Nogales, for example, is a ranch accessible by plane. The Meigs Ranch, though it caters to "dudes," is a real cattle ranch, and FLYING vacationists can get a taste of the ungarnished western life there. The ranch has a 3,400-foot sod landing strip and a guest house.

Colorful holiday celebrations on the Mexican side of the border attract flying tourists.

Eighteen miles north of Nogales is the Tumacacori Mission, founded in 1690 by a Jesuit priest, Father Kino. It is a national monument and is a fine example both of Spanish mission, and of Apache destructiveness. It is located on U.S. Highway 89. In conjunction with the restored mission, a museum is maintained—and contains exhibits depicting and reflecting Arizona life in the days when the mission was a center of activity in the area. The museum building was constructed in 1937 by WPA and is of Spanish architecture.

Among other historical sites in the immediate vicinity of Nogales are Fort Crittendon and Fort Buchanan, U.S. Army posts, which served as havens for early settlers against raids by treacherous Indians. Ruins of these old forts, which may still be seen near Nogales, are indicative of the section's romantic and tragic history in the 1800's.

In the Arizona section of Nogales, there are golf courses, movies, shops and modern hotels. Rates are from $1.50 a day up to $6. The Santa Cruz County Chamber of Commerce has a list of hotels, dude ranches and auto courts. However, the real tourist attraction is the Sonora (Mexico) section. U.S. citizens can enter a 12-mile zone in Mexico for 48 hours without papers or border expense, and for a longer time at trifling cost.

Typical Spanish bullfights are held from time to time in the Mexican part of the city. The average North American spends hours exploring the narrow streets, the curio shops and cafes in the town. Gourmets are particularly delighted with one restaurant (known as the best in western Mexico). The Cavern Cafe (once a jail, and now an historic Mexican landmark) has a menu with both variety and, by State standards, unusually low prices: Roast or broiled mallard duck, $2.50; three quail, broiled or fried, $3; fresh lobster Newburg, $2.50; venison steak, $2.50; antelope steak, $2.50; T-bone steak, $2.75; fresh turtle steak, $2; fresh frog legs, $2.50. Those are typical dishes—and prices are in U.S. currency.

The Nogales International Airport, owned and operated by Jack Evans, recently became a regular port of entry for airplanes going in and out of Mexico. The Mexican Government has customs inspectors available there for the convenience of private and commercial pilots. Two Mexican airlines make the field their northern terminal. Procedure for clearing a private craft has become simpler and cheaper, thanks to persistent efforts. As of now, it takes about an hour, just about what you'd spend resting and re-fueling anyway. According to Evans, there is no charge for a plane permit, but there is a $6 Mexican charge (which may be removed soon) for in-

AIRPORTS NEAR NOGALES

Landing field (Latitude and longitude)	Name of nearest town and distance	Longest runway and altitude above sea level	Gas grades	Service facilities	Additional information
Nogales International Airport (31°25'-110°51')	Nogales 8 mi. NE	6,200' Alt. 3,800'	80 & 91	A & E mechanic. Port of entry. Night lighting. Coffee shop. Hotels.	Jack Evans, Manager, Nogales Int'l. Airport, Box 196, Nogales, Arizona, Phone long distance—Airport No. 1.
Kinsley Ranch Airport (31°43'-111°03')	Located on ranch near Amado, Ariz., 1.6 mi. NNW	3,500' Alt. 3,100'	.....	Cafe, day sports.	O. V. Kinsley, Kinsley Ranch, Amado, Arizona
Nogales Central (31°22'-110°56')	Nogales 3 mi. N	2,200' Alt. 3,600'	80	A & E mechanic.	Horner Tulley, Manager, Nogales Central Airport, Nogales, Arizona
Meigs Ranch (31°28'-110°36') App.	Patagonia, Arizona 15 mi. NW	3,400' Alt. about 3,500'	.....	Private rooms, meals, ranch sports.	James B. Meigs, Meigs Ranch, Patagonia, Arizona
Hermosillo Airport (29°07'-110°57') App.	Hermosillo, Mexico 1 mi. N	5,000' Alt. below 1,000'	80 & 91	Hotel, transportation	Hermosillo Airport, Hermosillo, Sonora, Mexico
San Germaa (27°55'-110°54')	Guaymas, Mexico 3½ mi. NW	4,225' Alt. 58' $5.00 landing fee	80 & 91	Hotels, resort activities.	Eldred H. Tanner, Manager, Hotel Playo de Cortes, Apt. 66, Guaymas, Sonora, Mexico

specting baggage weekdays. On return trips there is no charge by American officials, except on Sundays and holidays, when special arrangements must be made with charges anything up to $20. Tourist permits good for six months cost $2.04.

The reason for elaborating on border procedure is that Nogales is one of the best places to enter Mexico on a flying trip to that superb fishing spot—Guaymas. Many sportsmen consider it Mexico's best fishing port, bar none. From Nogales it is an easy flight, following a valley route which has a railroad and highway. There are five airports along the 240-mile run, including one at Hermosillo, capital of Sonora State. The best known Guaymas hotel is the Playa de Cortes, built by the Southern Pacific Railroad and now controlled by Mexico Hotels, Ltd. It was intended as a sportsman's hotel and is now used by all vacationists. The rates are $12.50 per day, and reservations can be made with any Southern Pacific or travel agent. Mexican airline, Aeronaves, runs trips seven times weekly from Nogales, round trip $30. It is possible to store a plane at Nogales and continue to Guaymas by Aeronaves if you don't wish to handle border details or fly over the country personally.

The Guaymas fishing in late winter is for totuava, sea trout, rock bass, snapper, shark and giant ray. Only the latter two require deep-sea craft (which can be chartered for $40 per day). The fishing permit costs about a dollar. Few flyers would want to bother with either Arizona or Sonora hunting in the winter. In Arizona most seasons except rabbit and javelina are closed, and in Mexico there are innumerable technicalities involving such things as permits, photographs and bonds, not to mention $25 to $50 charges for different permits. However, the Nogales Chamber of Commerce has all details on Mexican game, permits, accommodations, currency, health measures, customs regulations.

The International Airport is eight miles northeast of the city. It has one 6,200-foot paved runway and a 2,500-foot unpaved strip, a good shop with A&E service, 80 and 91 octane fuel, coffee shop and a 100x100-foot hangar. There is limousine service to town for 80 cents and customs offices are at the field. Night lighting on request. Manager Jack Evans is always glad to give assistance to visiting pilots.

Kinsley Ranch Airport is between Tucson and Nogales on U. S. 89, near Amado, Ariz. As the name implies, it is a ranch flight strip 3,500 feet long. There are no overnight accommodations but there is a cafe. Riding, boating, and fishing are available during the day. As far as is known there is no regular fuel supply.

Nogales Central Airport is an unpaved strip of 2,200 feet three miles north of Nogales. There is fuel and aircraft service. The field is used mostly by a few local flyers.

For those interested in going to Guaymas via International, the following Mexican airports are suggested.

Hermosillo Airport at Hermosillo, Sonora. There are three 5,000-foot dirt runways, 80 and 91 octane fuel, minor repairs, ground transportation, hotels, and some sports. The airfield is one mile north of the city and has a radio station.

San German is Guaymas' airport, is 3½ miles northwest of city. It has one 4,225-foot strip, gravel, 58 feet above sea level and also has 80 and 91 octane fuel and minor repair facilities. It is an airline stop. Visiting planes pay $2 landing fee (U. S. currency). Landing, transportation, and recreational arrangements can be made through the manager of Hotel Playa de Cortes, Eldred H. Tanner.

Southern Arizona is in the southern sun country but, as Nogales is 3,800 feet above sea level, the city is spared the sweltering heat of lower levels. To plan a trip there flyers will need the Douglas (P-3) sectional chart. The Phoenix chart, (Q-3) is useful as it shows Tucson and Phoenix, places to be considered on en route flights. For those going to Guaymas, the Sonora River World Aeronautical Chart, No. 471, is suggested. It shows a great deal of the surrounding area and is much easier to handle in a plane than two or three big sectionals. Although geographical details are smaller, it should be quite easy to follow because of the railroad and highway following the valley south out of Nogales.

The area is one of the southwest's best known vacation areas. Because the city has a good, well-run airport, has American facilities and recreations on the U. S. side, "different" Mexican sights and sensations on the other, and is at once a gateway to America's dude ranch region and Mexico's best known resorts, there is little wonder that southwesterners are talking about it.

—Robert J. Whittier

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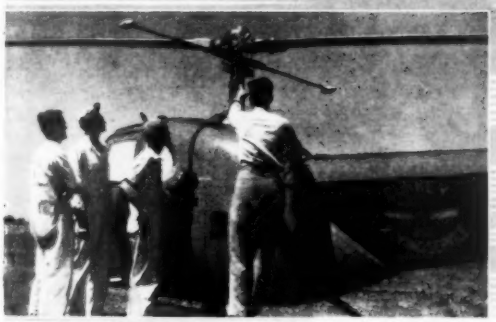

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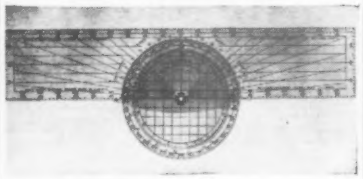

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What's Wrong with Omni-Range?

(Continued from page 38)

the course, so that, for safety, the 'path' would have to be considered about four degrees wide. Thus, there would actually be only about 90 different courses at one altitude level."

In short, even the pilot can't tell whether he is on course because the azimuth bearing he has taken is from one to four degrees off in either direction.

Which is the same as saying that VOR has angular errors and that it can give inaccurate position information.

As a matter of fact, disinterested observers say that the error is plus or minus five degrees, or a total of 10°. This cuts down the number of possible courses to 36, but to be on the safe side, only 18 could be flown with real assurance of avoiding collisions.

Radio engineers and scientists questioned by FLYING claim that VOR *is* subject to large angular errors and always will be because of a violation of a basic principle of physics.

In semi-scientific language, this principle sets forth that "under the worst conditions, the largest angular error possible in any system is 57° divided by the number of waves that could be laid end to end across the antenna system." In other words, a 100-wave-wide radar antenna can never do worse than .57°. Under good conditions it can do better, and usually will.

But you take a calculated risk if you rely on it to do better than that accuracy. The *poorest* radars of 1942 vintage had antennas 12 waves wide, as contrasted with the best 1947 CAA-backed devices, which have antennas only two waves wide, and the ODR antenna which is less than one wave length wide.

This is the crux of the matter and no amount of argument can change the facts, scientists assert.

For more clarity, the reader's memory should be refreshed on the relationship between angular errors and linear errors. Angular errors are measured and recorded in degrees. If a person is five feet from a VOR radio antenna, a one-degree error only amounts to an inch of linear error, but at 57 miles the same error amounts to one mile.

The rule of thumb is that one degree is a mile at 57 miles or roughly 60 miles.

So 10° equals: 10 miles error at 60 miles range; five miles error at 30 miles range; one mile error at six miles range.

Or 2° equals: two miles error at 60 miles range; one mile error at 30 miles range; ½ mile error at 15 miles range, and so on.

Consequently, a plane faced with the four degrees of tolerance admitted by CAA would be anywhere up to four miles off true azimuth bearing to the ground station at 60 miles distance.

Faulty design is responsible for VOR's large angular errors. In order to assure small angular errors, a unit must have very short waves and/or a big antenna, preferably both. Either requirement tends to increase the number of waves that can be laid end to end across the antenna. This fact was well known a hundred years before radio was even invented. It is directly based on optical theory, and is not disputed.

In VOR, the antenna is less than one wave length wide, and therefore has virtually no directivity. For any approach to true accuracy, VOR antennas would have to be many times wider than they are now and the whole system would have to be drastically changed to utilize larger antennas, with cost skyrocketing. No plans for increasing their sizes have been announced.

So there is cause for alarm when official reports on the results of tests with one VOR station reveal errors as high as 10½°—or 10½ miles at 60-mile distance!

Some proponents of VOR may argue that this one test was with early equipment and that up-to-date VOR facilities reduce the chances of error. But not much. In newer types the antenna structure is basically identical with the old.

In 1946 the Electronics Subdivision, Advisory Group for Air Navigation, Air Technical Service Command, summarized all known and proposed air navigation schemes. In the conclusions of the analysis of the VOR, the document approved VOR for adoption, but stated:

"The VHF omni-directional range is capable of furnishing an aircraft with its bearing . . . in any direction with an accuracy somewhat better than plus or minus 5° . . ." And later:

"Characteristics of the system—Accuracy: (a) Ideal or best theoretical, plus or minus 2.8°. (b) Actual, plus or minus 5° (may be improved). Equipment: Complexity and weight. (b) in aircraft; receiver employs standard VHF practices, converter is fairly complex. Weight, about 25 pounds."

In another report of an early test, it was officially stated in part:

"Altitude effects, both over a poin. southeast of the range which had given erratic results and over a staple and accurate point to the northwest, were checked in a flight to 9,000 feet. Over the erratic point, the indicated bearing changed by eight degrees between 1,500 and 3,600 feet and thereafter held constant within plus or minus one degree up to 9,000 feet, but remained considerably displaced from its true value over the reliable point . . ."

Engineers sifting the above statement that the indicated bearing changed *eight degrees between 1,500 and 3,600 feet*, or in 2,100 feet, logically asked:

"How about a plane letting down in the face of this admitted inaccuracy? If the plane starts letting down 57 miles away, it will be off course eight miles, and if 15 miles away, will be off course two miles. Imagine thinking you are eight miles from a plane 2,100 feet below you and finding him directly under you (if you can see) when you are completing your let-down!"

Siting of the ground station has to be selected carefully. It cannot be near objects which would reflect the beam. It can't be near roads, where passing traffic would cause variable course bands. It can't be near buildings. Therefore, the

imaginable can happen to an aircraft which is coming down on a bent beam.

In this connection, Peter Caporale, chief of the Radio Engineering Section of the CAA, recently stated in a report on VHF equipment:

"Siting [locating] requirements to insure satisfactory performance are difficult, of course, but can *usually* be met adequately."

And back to the Air Technical Service Command report:

". . . VHF radio ranges are subject to serious siting problems and their operating sites must be chosen carefully by experienced engineers in order to avoid undesirable reflections and resulting course bends."

The VOR system has the worst possible combination of weak direct waves and extremely large reflectable waves. When there is reflection, accuracy decreases. We get bends and errors in position measurement through reflections. There just is no way to get around it. This is stated in general terms but is borne out by scientific laws which cannot be repealed simply because they don't agree with CAA's own convictions.

Even when the units do give fairly accurate position indication, it is only because of radio "trickery"—various technical developments which radio engineers had to utilize in the fairly primitive equipment which was available in prewar years.

These engineers couldn't wait until the war-stimulated research had produced improvements in technique. They had to make certain radio aids work to a degree of dubious accuracy to give more safety to civilian and military planes.

They operated under what Sir Robert Watson-Watt calls the "principle of the third best." Sir Robert is famed as the inventor of British radar and was the leader in its important role in defending England. He always backed the third best radar set for mass production because "the first best is never finished and the second best comes too late." It is a fine principle so long as everyone realizes what is going on.

"But in this country, in the field of radio aids, when the third best systems are installed some persons get so attached to them that they insist they are really vastly superior to anything new that comes along, even years later," declared one scientist. "We are in that state now."

Because most every CAA-installed radio aid violates fundamental scientific principles, the units always will be imperfect although they can be made to operate through these tricks. But when you "beat" the laws of physics, you are getting into trouble. Difficulties do not necessarily come immediately, but one can never rule out the *possibility* that they will occur. As one scientist put it:

"If an individual obeys the laws of the people he is sure to stay out of jail. If he breaks the laws, he isn't sure of being put behind bars, but he definitely increases the chances of that happening."

Under "ideal conditions" several scientific principles fundamental to radio aids can be disregarded or broken. However, ideal conditions hardly ever exist except in theory and the chances of "being put

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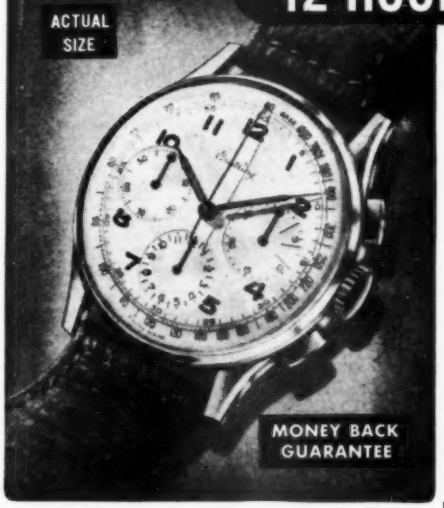

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behind bars" is increased to a large extent.

The CAA is planning to use distance measuring equipment (DME) in connection with VOR to give the pilot his exact distance from the VOR ground station. DME gives accuracy of 500 feet at all distances up to 50 miles. It is one of the soundest facilities in the entire CAA air navigation program. It has no course bends or reflections.

"It is absurd to couple such a device with an old-fashioned scheme like VOR which has distance inaccuracies of five to 10 miles at a range of 57 miles," declared one radio engineer.

"As long as they are going to use DME, they might as well get *both* their coordinates by measuring distances with an accuracy of 500 feet. The Shoran (radar) bombing system works essentially this way and it was accurate enough to bomb individual bridges through the overcast at distances of 50 miles from the ground stations. The CAA program just doesn't make sense. They can't say that they don't know how to measure position accurately, because they have been beating the drum for DME. And they can't say that they don't know VOR is an obsolete method of very low accuracy because numerous technical papers have pointed out this fact."

Peter Caporale's report on VHF also stated:

"It is interesting to note that an observer within range of two or more VOR facilities can obtain not only his bearing with respect to one of them, but also an absolute fix. Further, he can follow a course other than a radial one by obtaining absolute fixes at successive stages of the journey and navigate accordingly. An automatic means for doing this is in progress of final design and is expected to be available within the next year or two. The equipment required is DME and a computer."

One scientist queried stated boldly that "this is merely double talk to give the impression that VOR by itself can give a fix, but it ends up by stating that you need DME to do the job.

"Actually," he continued, "if the VOR System were any good, two measurements of bearing from two VOR stations should give a fix without any other equipment. You can get practically no fix with two VOR stations; a pretty bad fix with VOR plus DME, and an excellent fix with two DMEs and no VOR."

One point made in favor of VOR is that it allows many tracks to be flown between two points on the airway. But radio engineers and scientists insist this large theoretical number of tracks cannot be realized in practice because of the inaccuracies of the VOR system and because DME will not be available for some time. When it is, the limit on the number of tracks to be flown will again be set by the inaccuracy of VOR. The entire job could be done with DME.

It can be argued that to fly with two DMEs requires the use of a computer to convert distance measurements into left-right error signals about the track to be flown. But a computer is also necessary in the VOR-DME proposal. The information put out by a computer is only as accurate as that which is fed into it.

"And the information you feed in from a VOR," commented an engineer, "is only slightly better than what you could get from a ouija board."

Congress itself apparently doesn't think too well of CAA's air navigation and landing aids program. The report of Representative Carl Hinshaw's subcommittee (on landing aids to air navigation and landing) of the House Interstate and Foreign Commerce Committee, expressed disfavor with instrument landing system (ILS) and VOR, but favored airborne radar and radar beacon navigation. Radar beacons are simply DME stations. This report may have considerable bearing on total appropriations by Congress for navigational aids this year.

The Committee recommended that further establishment of VOR ranges be stopped except for experimental purposes and that ILS installations be suspended "pending development of an ILS that promises to be satisfactory."

The CAA has plans to install 465 VOR range stations along U. S. airways. One station alone costs about $44,000 which, multiplied by 475, makes a total of $20,460,000. Added to this is a CAA-estimated figure of $7,700 annual maintenance cost—a total of $3,580,500 a year. In addition, a system to give distance from the station is contemplated at an added cost of $15,000 per each of the 465 stations, with an extra annual maintenance cost of $4,500 per each unit.

Altogether, this would total $27,435,000 for installation, and $9,067,500 for annual maintenance.

Late in 1947 there were five omniranges in commission for test work, plus 24 commissioned but unmonitored. Four stations were to have gone into operation on the Cleveland-Boston airlane. Forty additional transmitters are to be erected in CAA's Region 1 as certain radio parts become available.

Two important groups, the Air Transport Association and the International Civil Aviation Organization, have thrown their support and approval behind the CAA-sponsored facilities.

However, the Aircraft Owners and Pilots Association is on record as being strictly opposed because omni-ranges benefit only the commercial carriers, or those with financial means and aircraft large enough to carry the special equipment required. Cost of the airborne equipment, weighing approximately 25 pounds, is believed by AOPA to be too high for the average lightplane owner.

There has been and will continue to be a great amount of money spent on radio navigation aids. Consequently, it is often asked whether CAA would be willing to scrap the various faulty information-giving systems if s c i e n c e proved them fundamentally unsound and came up with systems constructed in accord with sound physical laws.

The CAA may be given a chance to answer this question within the immediate future, as several new technical developments of this nature are nearing the test stage. A system of air navigation with a near-perfect accuracy will be developed in time. Under it perhaps *even* the private pilot will benefit. END

Letters

(*Continued from page* 6)

it was. As a private flyer, I suggest that the Government pass a Federal regulation that every community of 200 or more should have one or two of its largest buildings adequately painted with the name of the town in very large legible letters.

From a service standpoint, it is my experience that there is a great deal to be desired in the average airport. On a trip some time ago I stopped at a Marion, Ohio, airport and actually had to beg the individual there to come out and sell me some gas.

I was also interested in your comments on salesmanship. It has been my experience that airplane salesmen really don't want to sell their products. They just sort of endure the fact that they are salesmen and have an agency for a certain aircraft.

L. L. GRUBB
Secretary, The Brethren Home Missions Council, Inc.
Winona Lake, Ind.

Mr. Anderson states, "I never did get a Sacramento chart, though I tried to get one at five California airports." For his and other transient pilots' information, the Dupen Flying Service at Sacramento Municipal Airport at all times maintains a complete stock of all West Coast sectional charts.

DALE BEACH
Sacramento, Calif.

I had heard tales that jibed with your account but after becoming acquainted with the operators in my little flying sphere, I began to wonder.

Of course, mine is not a large world, just Nebraska, Kansas, and a good share of Colorado, but to date I have never paid for transportation to a town when I landed on a port. I have never paid for the privilege of landing or tie-down and very reasonable hangar rent when I desired it. I have eaten some fine meals at reasonable prices in the few ports where there were lunchrooms, but where there wasn't one, the personnel directed me to a good one in town and in many instances loaned me a car to go there.

H. R. HEWETT
Hewett's Airport
Beaver City, Nebr.

Last August I flew a Cessna 140 to New York City. Since I made 20 different fields in 14 different states, I thought you might like to know my findings.

Out of the 20 fields we visited, there were poor rest rooms at all small fields and the large ones were very dirty. Two gave good service, all helped get nice hotel accommodations, three furnished transportation, five helped us get cabs.

Most of the fields were well marked but we purposely picked the larger fields when possible, hoping to get better service. Very few towns were marked. Gas and oil was from 25 to 32 cents (oil 35 cents per quart). However, everyone seems to charge $3 an hour for labor for which they pay less than $7 a day—

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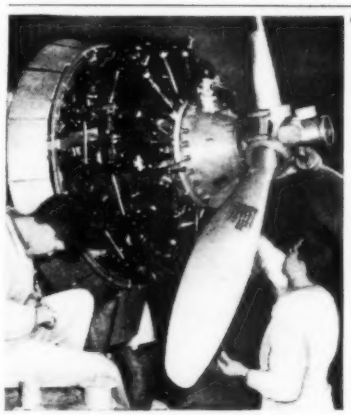

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and does that airport clock run fast.

In summing up I will list a few things I know would help airports: (1) pay higher salaries so the owner can expect better service out of employees; (2) build all hangars and offices in the same area so it isn't necessary to take a train to the restaurant, or transportation around the field; (3) have the AOPA issue courtesy cards that would be good at all airports; and (4) have the AOPA sponsor a drive to get all airports to improve their transit service.

HARVEY J. FERGUSON

Pearsall, Tex.

My pet gripe is the gasoline deal which Mr. Anderson says is perfectly all right. It may be in the area he covered, but I doubt it as he did not make wholesale and retail comparisons which is the only basic method to use. A four-cent margin has been usual for many years and yet with few exceptions the flying consumer is being stuck for from five to eight cents per gallon. In other words they have to make up to one-third to sell a high turnover item.

Hope that for the good of private flying you will bring out more of these evils—over-statement will do more good than a whitewash job.

T. J. S.

San Francisco, Calif.

● Mr. Anderson was concerned only with the retail price of aviation gasoline. The evils of excessive mark-up, however, are an ever-present problem, as Reader T.J.S. points out. It is not uncommon for an airport operator to charge as much as 11 cents per gallon over the wholesale price, as compared with an average of about 4½ cents a gallon mark-up for premium automobile gasoline. All the major oil companies have deplored this tendency among airport operators, yet the average mark-up on aviation gasoline throughout the country still is approximately seven cents a gallon. Also, at municipal airports it is becoming common for the city to charge a two-cent tax on every gallon of aviation fuel sold.—ED.

NOVEMBER EDITORIAL

Your editorial, "Mr. Marshall Suffers a Lapse of Memory" recently came to my desk with a pencilled note "worth reading." I thoroughly agree.

Like many another American I have reason to worry about the state of our nation and world. I am thoroughly in support of reasonably helping others elsewhere to help themselves but certainly I shall do what I can to keep our national defenses both strong and resourceful.

Any further editorials will find a ready welcome here.

HARRY P. CAIN
United States Senate

Washington, D. C.

DC-6 FIRES

YOU HAVE PROBABLY READ THE RELEASE OF T. P. WRIGHT, CIVIL AERONAUTICS ADMINISTRATOR: "... THAT OVERFLOW OF GASOLINE WHILE IT WAS BEING PUMPED BETWEEN THE MAIN TANKS AND AUXILIARY TANKS CAUSED THE [DOUGLAS DC-6] FIRE AT GALLUP ..." NOW THAT OUR HEATERS HAVE BEEN EXONERATED WE WILL APPRECIATE ANY EDITORIAL STATEMENTS WHICH WILL EMPHASIZE THIS.

Surface Combustion Corporation

Toledo, O.

● The Surface Combustion Corporation manufactures the gasoline-burning Janitrol heaters used in the DC-6 for cabin heating and de-icing.—ED.

ARTICLE ON GRAND TRAVERSE BAY

The FLYING Holiday article on Grand Traverse Bay (July issue) was well received here.

There was one little item, however, that greatly reduced its effectiveness as far as we are concerned. It stated that, for information concerning our airport, one should write to the Traverse City Chamber of Commerce. Traverse City looks out only for itself, as this example shows:

A flyer whom I know personally was flying to Northport and passed over Traverse City, called the tower, asked about the condition of the field at Northport and was told there is no such field. He knew there was, of course, so continued on to make his landing here.

Information concerning our airport and resorts will be given by the Northport Chamber of Commerce.

I. N. HAGEN
Airport Manager

Northport, Mich. END

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D17-S BEECHCRAFT, low time, hand-rubbed finish. Bendix radio 3105-6210. ADF, night license, flares, 3 450 Pratt-Whitney engines. C. Gorin, 2114 Ave. H, Wichita Falls, Texas.

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CESSNA

CESSNA Twin T-50 (Canadian). Tested fabric, full instruments, 460 engine time, estimate additional $300. To license, taking loss at $900. Nelson G. Thomas, 327 Douglas St., Salt Lake City, Utah.

CESSNA UC78. Constant speed props, two generators, battery and radio in noce, leather upholstery, 500 hrs. since manufactured. $9,000. K. G. Messer, Galax, Va.

CESSNA 140, 1947. 90 total hours, Lear Px-er, T&B, clock, sensitive altimeter, heater, cigarette lighter, landing light, McCauley steel cruising prop. Private owned since new. $2800. J. C. Forburger, Box 116, Arkansas City, Kansas.

1946 CESSNA 140. Fully equipped for instrument flying, privately owned and hangared, 2-way radio, heater, low time, never damaged. John Nonnamaker, 900½ E. Elm, Lima, O.

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CULVER "V", 1947 sensitive altimeter, 2-way radio. 71 hours total time, licensed to September 1948. Exceptionally clean. Sacrifice for best cash offer. Box 564, % Flying.

DART

DART Model G. Just completely overhauled and relicensed. Lambert 90 H.P. motor, less than 450 hours on plane and motor, Hamilton adjustable steel propeller, two-way Bassett Radio, Navigation Lights. Fine acrobatic ship, cruises at 110 on cross country, very economical. Have bought new Bonanza. Priced for quick sale at $1750.00. A bargain. Gibson Bradfield, Barnesville, O.

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ERCOUPE, perfect 1946. Radio loop, lights. McCauley prop. Relicensed Sept. Best offer around $2500. Ernest Babcock, 31 Fairchild Ave., Morris Plains, N. J.

ERCOUPE Brand new late model 1946. Located in showroom. 5½ hours total time. Price, $2250 or will trade new car. W. Foxall MacElree, Wayne, Pa. Phone Wayne 2100.

ERCOUPE late 46. Fully equipped. Exceptional care and condition. $2350. P. Blaisdell, 102 N. Madison, Pasadena, Calif.

ERCOUPE, late '46, excellent condition, 60 hours total, just relicensed. Air Radio 52, Sun Visor, two props and extras. Deliver anywhere within 200 miles. Price, $2,400. Joseph Introcaso, 141 Brunswick St., Jersey City, N. J.

1946 ERCOUPE 415-C. Less than 100 hrs., 2-way radio with loop, gyro horizon, turn and bank, sensitive altimeter, etc., stall warning, engine hour meter, outside air temperature. Suitable for instrument training. Plexiglas and goggles go with ship. One owner. Cost over $4000, will sell for $2795 or make offer, no trades. J. P. Cutting, Warrenton, Virginia.

1946 ERCOUPE. 50 hours (stored). All bulletins accomplished, 100 hour check just completed. Like new. $1750. Ira J. Sellers, Jr., 2101 North First Avenue, Birmingham, Ala.

ERCOUPE. Late '46. Like new, 135 hours, sensitive altimeter, always hangared, never scratched. Bargain at $2,425.00. Box 875, Sioux Falls, S. D.

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FAIRCHILD Cornell complete with instruments, new engine, new prop., new tires, finished silver and blue, red and silver sliding hood. C. of A. Fly away Montreal, $1,550.00. Southern Industries, Ltd., Marieville, Quebec.

FAIRCHILD PT-19B. 260 hrs. since O.H. Flyable, structurally sound, licensed. $850. Phone: Merion 5552-R. W. F. McComas, Jr., 521 Baird Rd., Merion Station, Pa.

FAIRCHILD PT 19 with full set of instruments, blue with yellow trim, new fabric, 450 hours since major. 403 Sunset Blvd., Goshen, Ind.

FAIRCHILD 24 W41A, 165 Warner, privately owned. Total time, aircraft and engine, 750 hours. Approximately 325 hours on engine since major. Interior and exterior in excellent condition. Complete blind flight group, wheel pants. Will deliver for expenses. $4750. Contact: Aviation Industries, Inc., Box 431, Coeur d'Alene, Idaho.

FAIRCHILD PT-26: Ideal for GI school, hatch, full blind groups both cockpits, landing and navigation lights, flaps, cabin heaters, low time since new and license. Make offer. Want good J3 Piper. Mr. Colwell, P. O. Box 58, Eugene, Oregon. Phone 4428J.

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GRUMMAN Widgeon steel props, excellent condition. 170 hours on engines since overhaul. Price $17000. Windle Aviation Company, Millbury, Mass.

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85 h.p. 120 HOURS, perfect condition, GE 2-way, nav. lights, leather seat, Beech prop, prop cover, terrific for XC, licensed to May. Cost $4400, will sell for ?. Box 560, % Flying.

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HOWARD DGA-15-P. Licensed until January, 1948. 450 hours since new, night, instrument, 24 volt, pants, spinner, constant speed, two transmitters, three receivers, four chutes, flares, excellent fabric and maroon paint. $3,995, will add cash and trade for licensed Beechcraft D-17S. Ray Shannon, 50 Hawthorne Street, San Francisco, Calif.

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1941 LUSCOMBE 8A, 65 Continental, just completed 100 hour relicensing inspection. 160 hours since major overhaul. Total time 600 hours. Two-way radio, generator, all instruments, perfect shape. $1400, no trades. Isabel Anderson, 250 South 17 St., Philadelphia, Pa. PE-5-5245.

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LUSCOMBE 8A. Mfd. May, 1946. $1650. Write Monroe Arne, Carpenter, S. D.

NAVY

NAVAL Aircraft Factory N3N-3. Recovered, relicensed, 100 hr. check. Excellent condition. Red and silver. 235 H.P. Wright. 380 hrs. since new. Will sell for best offer. John McIver, 45 South Third St., Oxford, Pa.

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NOORDUYN Norseman. First offer over $2000.00. Can be put in A-1 condition for $1600.00. Box 554 % Flying.

NORTH AMERICAN

NORTH American SNJ-4. 400 hrs. total time. Just relicensed day and night. Clean. Converted Navy command radio to 3105. Complete instruments and new tires. Bargain at $3000.00 for this ship. Write or contact 1st Lt. John L. Crone Sqdn. TS-1, 3704 AAFBU, Keesler Field, Miss.

SNJ4. Licensed, 720 hours since new. 320 hours since Navy major. Clean, excellent, mechanical and flying condition. Bargain for $1500. Mack Stricklin, Box 229, Florence, S. C.

PIPER

PIPER Super Cruiser, January, 1947, less than 25 hours. $2995.00. Gierston Tool Co., Inc., 326 E. Water Street, Elmira, N. Y.

PIPER Cub, 65 h.p. '47 model. Excellent condition. Mrs. C. Neal, Oklahoma City, Okla. Phone 53663.

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REPUBLIC Seabee, new last of May, 1947. Total time, 55 hours, ship like new and only used for demonstration purposes. Complete instrument group and radio, steerable tail wheel and all latest bulletins, price $5500. Frank L. Sample Jr., Inc., Boothbay Harbor, Maine.

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SAILPLANE, Laister-Kauffman LK-10A, Serial 93, two sets instruments and trailer. Licensed to September, 1948, total time 82 hours. $800. Fort Payne Flying Service, Ft. Payne, Alabama.

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PACKARD Dealer will trade new 1947 Packard Custom Eight 7 Passenger Sedan for Navion or Bonanza. Black car with tan trim. Has radio, front and rear underseat heaters, dual defrosters, overdrive and electromatic clutch. List price, delivered includes taxes, accessories, transportation and license plates, $5165.00. This is a showroom car, which has never been licensed or used. Burdette Olson Motor Co., 478 W. Michigan Ave., Kalamazoo, Michigan. Phone 9668.

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ARTIFICIAL horizons and Directional gyros, used in guaranteed workable condition, closing out at $12.50 each. Many other instruments, write for list. Hoffer Flying Service, Camden, South Carolina.

TWO Stearman Dusters and one Sprayer (capacity 140 gals.). Good condition. Will sell separately. Price, $6500.00 complete. John L. Barden, Ithaca, Michigan.

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BT-13A, AT-6 OWNERS having radio receiver type BC-229 or BC-429, adapt your radio for Standard Broadcast reception. Simply plug-in this new HI-LO coil-set covering regular tower-range and standard broadcast bands. Guaranteed, $16.95. FOB. Aerotronics Services, Airport, Culver City, Calif.

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AIRLITE Intercom. Self contained, sturdy, light, electronic intercom systems engineered for lightplanes. Complete with headset, microphone, volume control, batteries, and mounting bracket. Weight approximately 1½ pounds. Several models available. Write for illustrated information: Airlite Research Company, P. O. Box 712, Port Washington, N. Y.

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COMPUTERS, Dalton Model G, which straps to the leg, leaving one hand free, (formerly sold for $50.00) now only $7.50; Rolaire deluxe map cases for safe, easy pilotage, $14.95; Model G Rolaire, $9.95; AAF-type A-2 computer, $2.00; Weems plotter for measuring courses, speeds, distances, $2.00; New Model C American Airlines computer in leather case, with instructions, $5.00; E-6B Army computer, most widely-used computer in aviation, $10.00 (with leather case & instructions); and from our large war surplus stock; Army D-12 aperiodic compasses for aircraft, airports and marine vessels, $12.50; astro-compasses, with instructions, now only $8.75; Longines pocket compasses for sport or work, new, $1.20; Dietzgen 6-inch protractors, 20c; Elgin pocket stopwatches, like new, $12.75; Bausch & Lomb sextants, $37.50; like new F-8 aerial cameras, a "best buy of the month" at $175.00; pilots' briefcases, $6.50. Inquiries about new dealer agencies welcomed. Pan American Navigation Service, Dept. F-1, 12021 Ventura Blvd., N. Hollywood, Calif.

E6B COMPUTERS. Steel Construction with leather case. New, $8.00 postpaid. Used, $5.00 postpaid. Dozen, $45.00. Southwest Supply, Sanderson, Texas.

ALL wool gabardine L-1 flying suit, nine zippered pockets, in all sizes. While they last—$7.95. Your last chance to buy this garment at this low price. R.A.F. Manufacturing Company, 6 East Lake St., Chicago 1, Illinois. Buy direct and save.

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A-2 TYPE flight jackets with genuine Mouton fur collar. Body make of the finest front quarter horsehide. All sizes. Priced at $19.75. R.A.F. Manufacturing Company, 6 E. Lake St., Chicago 1, Illinois. Buy direct and save.

GLOVES B3A. New, AAF Flying Gloves, dark brown unlined genuine kidskin leather, all sizes $2.95 pr. Same glove in natural buckskin $3.95 pr. G.I. Gloves, khaki wool, leather palm, $1.95 pr. Regular wool knit glove, brown or maroon $.95 pr. Gauntlet, one finger mitten type, baby lamb lined, dark brown goatskin leather, all sizes, $7.95 pr. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

A2 FLIGHT Jackets, Army type, dark brown horsehide leather, cloth lined, zippered, elastic-knit waistband and cuffs, sizes 34 to 44, $18.75 or with dark brown mouton fur collar, $20.75. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

NAVY Intermediate Flight Jackets. New, genuine dark brown goatskin leather, mouton fur collar, bi-swing back, celanese lined, zippered, elastic-knit waistband and cuffs, 34 to 48, $35.00. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

GENUINE Winter Navy Flying Jacket. New, ANJ, dark brown leather, beige color sheepskin lined, large shearling collar, zippered, two large patch pockets. Sizes 34 to 48, $29.50. New ANJ Trousers to match, zippered down both legs, shearling lined, same sizes $12.00 pr. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

HELMETS, AAF, new, A-11 kidskin leather, chamois lined with sponge rubber earcups, $3.45 or ANH15 tan gabardine, $1.00. Sun Dodger Flying Caps, long visor, khaki or olive drab twill, $1.15. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

FLYING Suits L1 olive drab wool gabardine, 9 zippers, medium $12.00. K1 tan byrd cloth, light weight, 9 zippers, small, medium and large. State weight and height, $10.00. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

B3 PILOT Jacket, Army type, sheepskin lined, dark brown leather, zippered $20.00. B2 Pilot Cap, sheepskin lined, long visor ear laps $3.75. Pilot Vest, sheepskin lined, $7.00. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

TIRES. Aircraft, new, 6.00x2 solid $1.25, 10:00 tail wheel $8.50, 8.90x12.50, $9.50, 5.00x4 $6.95, 6.00x6 $9.50, 7.50x10 $11.00, 8.50x10 $12.00, 12.50x4½ $6.00, 27" $11.00, 30" $21.00, 33" $23.00, 47" $30.00. Other sizes and tubes also. Complete new wheels, tires and tubes for AT6 or BT13 $65.00 per set; subject to prior sale. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

WRIST Watches—A-11, new, Elgin AAF with large sweep-second hand, 15 jewel. Guaranteed against defective workmanship for one year. Price includes tax $31.75. Tie down Kits—Heath, for light aircraft $4.50 or D1 set complete with zippered case includes 3 ropes, 18 spear heads, a lifetime kit, $8.00. Aircraft inspection Flashlight with long adjustable nozzle $1.50 each. Aircraft License Holders, black artificial leather, celluloid window, size 7x4¾ .35c. Microphones, push button telephonic, T38C, $6.75 each. Low Impedence Head Set, large ear cups, $3.50 each. Head set extensions $1.00. Safety Belts. khaki, std. $1.50 each, Aircraft Clocks, Elgin, 8 day, four dials, elapsed time $65.00. All new items. Write us on instruments, props and engines, etc. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

GOLD Stamping—Names stamped in 24K gold lettering on dark brown leather strip to sew on jackets, etc. One line .65c, two lines $1.00. No C.O.D.'s on stamping orders. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

AIRCRAFT Radio—GE Transceiver, AS1B, new, $165.00. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

PILOT Boots. Shearling lined, dark brown leather, rubber bottoms. Army type with one zipper of Navy type, two zippers and partial rear lace. All sizes. $16.95. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

BINOCULARS. New 7x50 Bausch & Lomb Binoculars with case and straps, $145.00 plus 20% tax. All types Bausch & Lomb Binoculars. Flying Equipment Co., 1641-5 W. Wolfram St., Chicago 13, Ill. Dept. F.

BATTERIES. New, Aircraft, 4 types. AN3150 heavy duty, 24V, 34 Amps with quik-disconnects $32.50 without $29.00 dry, add $4.00 for charging. AN3151, 24V, 17 Amps, shielded $24.75 dry add $3.00 for charging. AN3152, 12V, 34 Amps, $19.75 dry add $3.00 for charging. Ready to go, guaranteed. NAF1062-17, smaller 12V, 17 Amps, $17.00 dry. Add $3.00 for charging. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

NEW B-3 or ANJ-4 sheepskin lined fur jackets reinforced with horsehide. In all sizes $22.50 B-2 sheepskin cap in all sizes, $3.75. R.A.F. Manufacturing Company, 6 E. Lake St., Chicago 1, Illinois. Buy direct and save.

NEW A-2 type flight jackets in genuine goatskin. Knit cuffs and waistband, zippered front. Priced at $18.75. Names engraved in gold on leather strip with wings for only 75c. R.A.F. Manufacturing Company, 6 East Lake St., Chicago 1, Illinois. Buy direct and save.

NEW A-2 type flight jackets made of the finest horsehide or goatskin. Zippered front, knit cuffs and waistband with roomy snap pockets. Regular sizes priced at $18.75. For big men, sizes 48 and 50 priced at $19.75. R.A.F. Manufacturing Company, 6 E. Lake St., Chicago 1, Illinois. Buy direct and save.

NEW B-15 type jackets made of durable O.D. cloth. Alpaca lined, knit cuffs and waistband with genuine Mouton fur collar. All sizes. Now at only $11.95. R.A.F. Manufacturing Company, 6 E. Lake St., Chicago 1, Illinois. Buy direct and save.

RAY Ban Sun Glasses, original, ladies or gents $8.95, with sweat-bar $10.95, shooting glass with sweat bar $13.00 pr. Fisher Aviation Goggles, all types. Compass, Longines-Wittnauer pocket watch type compass $2.25. Mae West Life Jackets, $4.00, CO2 Cartridges for same .25c each. Genuine brown calf wallet, the finest $4.50. Pilot License Case, P-1 genuine Morocco leather $2.50, P-2 sheepskin leather $1.25, plus 20% excise tax on wallet and license cases. White Nylon Scarfs, 66"x18" $1.95 each. Flying Equipment Co., 1641-5 W. Wolfram St., Dept. F, Chicago 13, Ill.

BOOKS

COMMERCIAL and Private Pilot Ratings: Quiz system tests by Charles A. Zweng will help you win your flight ratings. For the private pilot, $1.00; for both commercial and private ratings, $3.00. Latest map-type examinations, with answers, are included. Pan American Navigation Service, Dept. F-1, 12021 Ventura Blvd., North Hollywood, Calif.

FLIGHT Instructor, by Charles A. Zweng, for C.A.A. examiners and applicants for flight instructor rating. Only book available which shows grading methods for flight maneuvers. Contains typical multiple-choice examination questions and answers. $3.00, postpaid or C.O.D. Pan American Navigation Service, Dept. F-1, 12021 Ventura Blvd., N. Hollywood, Calif.

MECHANICS' Examinations for 1948 can be found in "A. & E. Mechanics' Manual" (Zweng). New revised edition contains questions & answers not available elsewhere. 254 pages, $3.00, postpaid or C.O.D. Pan American Navigation Service, Dept. F-1, 12021 Ventura Blvd., N. Hollywood, Calif.

CAR for Pilots, a new book of Civil Air Regulations which apply to airmen of all ratings. Arranged & Indexed for fast, simple reference to any desired regulation. Includes latest revisions (to November 1947). Postpaid or C.O.D., $1.00. Pan American Navigation Service, Dept. F-1, 12021 Ventura Blvd., N. Hollywood, Calif.

ATTENTION Mechanics: Do you want your C.A.A. Aircraft and Engine License? "Ross Aeronautical Services" have spent two years compiling material which will enable you to obtain your licenses within 30 days and we guarantee you to pass your C.A.A. written examinations or every cent of your money will be refunded. Complete multiple choice examinations have been compiled covering every phase of the C.A.A.'s latest written exams and are priced as follows: Aircraft Mechanic $10.00; Engine Mechanic $10.00. If you desire both sets of examinations a reduced price of $15.00 is offered. C.O.D. or Postpaid. You have your Aircraft and Engine License to gain and not one thing to lose so act now! We are the Nation's outstanding specialists on Aircraft and Engine Mechanics C.A.A. written examinations. Ross Aeronautical Services, Dept. F, P.O. Box 1794, Tulsa 1, Okla.

FLIGHT Engineers: Charles A. Zweng's new "Flight Engineers Manual" contains typical examination questions and answers for flight engineer rating. $4.00, postpaid or C.O.D. Pan American Navigation Service, Dept. F-1, 12021 Ventura Blvd., N. Hollywood, Calif.

"THE Little Gray Book"—Fahey's U. S. Army Aircraft, 1908-1946—440 illustrations—One Dollar Postpaid. And Fahey's "Blue Book"—The Ships and Aircraft of the U. S. Fleet—Victory Edition—The Navy as of VJ—246 Illustrations—One Dollar Postpaid. Ships & Aircraft. 1265 Broadway, New York 1, N. Y.

COMMERCIAL Exam. Complete quiz, 30 questions and answers on each part, regulations, navigation, meteorology, aircraft and theory, engines. Similar to CAA written. Test yourself first. 50c cash, no stamps, no C.O.D. Money back guarantee. Hangar Flying, Dept. 1G2, 112 E. Grove, Bloomington, Ill.

STUDENT Pilots: A complete study course for Private Pilot exam. New Civil Air Regulations plus questions and answers. 84 pages, digest size, printed with large legible type, $1.00. Money back guarantee. Also Quiz books for Commercial, $2.50. Flight Instructor, $2.00, Navig-Aid, Cross Country Planner, $1.00. C.O.D. or postpaid. Hangar Flying, Dept. 1C2, 112 E. Grove, Bloomington, Ill. Clip this.

AIRCRAFT & Engine mechanics: Pass CAA exam for A&E mechanics ratings (License). 1947 manuals cover all required material, illustrations. Civil Air Regulations and latest multi-choice exam questions. Author holds A&E with 19 years experience. Aircraft manual, $1.75. Engine manual, $1.75. Combination, $3.00. Postpaid or C.O.D. Flight Press, Box 101-T. Edwardsville, Illinois.

HOT-ROD Manual, fast Fords, photos, instructions, $1.50. Air mailed, $1.75. Racing parts list, $.25. Hollywood Hot-Rod Los Feliz, Box 9626F, Hollywood 27, Calif.

PATENTS

FOR Patents and Trade Marks consult Z. H. Polachek, Reg. Patent Attorney, 1234 Broadway, New York 1, N. Y. Telephone, LO 5-3088.

INVENTORS: Without obligation, write us for information as to what steps an inventor should take to secure a Patent. Randolph & Beavers, Registered Patent Attorneys, 372 Columbian Bldg., Washington 1, D. C.

INVENTORS: Test the commercial value of your patented or unpatented inventions, quickly and inexpensively. Write for free information. Institute of American Inventors, Dept. 124, 1926 Eye St., N W Washington 6. D. C.

INSTRUCTION

FLIGHT Engineers' Course: enrollments accepted now. Prepare for a job with the airlines. Day or night classes. Free bulletin available. Address: Registrar, Pan American Navigation Service, Dept. F-1, 12021 Ventura Blvd., N. Hollywood, Calif.

VETERANS: Earn your wings: Free flight training under the GI Bill. Private, Commercial, Flight Instructor, Instrument and Multi-engine Ratings can be yours. Assistance given in arranging for living quarters and part time jobs if desired. Write now for full particulars: Adrian School of Aeronautics, Adrian, Michigan.

VETERANS, get your free flight training in the dude ranch country. World's best winter climate. Soaring, riding, hunting. Rodeos and other Western activities. Free housing. Hassayampa Air Service, Inc., Wickenburg, Arizona.

YOUR pilot's license quickly under G.I. bill. Private, commercial and flight instructor courses. Write. Gottschalk School of Aeronautics, Adrian, Mich.

G.I. FREE Flight Training under G.I. Bill of Rights in sunny Florida. A career and a vacation at the same time. Good fishing, hunting, swimming and boating. Subsistence and free housing. Write for details. Sanford School of Aviation, P.O. Box 980, Sanford, Florida.

WE guarantee you will pass your CAA written examination or money back. Proven homestudy instruction. Air Institute, MFG, Adams, Mass.

VETERANS: We invite you to spend a constructive vacation period in sunny Arizona where you can enjoy the world's best climate while learning to fly or becoming a licensed aircraft and engine mechanic under your G.I. Bill of Rights. Our city school system conducts a fine CAA approved flight and mechanics school under contract with the Veterans Administration. The VA pays for the cost of instruction and helps with your subsistence. We have plenty of low cost housing and invite you to the West's finest city. Gila County Chamber of Commerce, Globe, Arizona.

SITUATIONS WANTED

AIRLINE Transport Pilot desires flying position. Former Army Pilot. 1800 hours four engine, 200 twin engine and 1330 single time. Age 32. Thomas W. Laird, 1921 Empire St., Burbank, Calif.

PILOT desires position, private or commercial owner. Airline transport rating, 4900 hours total. 3000 hours multi engine. C. A. McKay, 7355 S. Kingston, Chicago 49, Ill.

EX-ARMY pilot desires flying position, 2500 hours, commercial license, single & multi engine land, age 27. Box 567, % Flying.

COMMERCIAL Pilot, single engine land & sea rating. Licensed aircraft and engine mechanic. Will consider anything anywhere as long as I can support family. Lewis Fairfield II, Box 164, Schroon Lake, Essex Co., N. Y.

EX-NAVAL Aviator, 1700 hours. Commercial license, single and multi-engine, college graduate, attorney, member of State Bar, two years business experience, single, age 29, free to travel. Desires position in aviation commensurate with background. Box 555, % Flying.

AIRLINE Transport Pilot desires position in company, executive or cargo flying. 4700 hours, 175 instrument, 350 night. Box 556, % Flying.

EX-NAVY and airline pilot desires permanent flying position. Former Staff Plane Commander. CAA Commercial multi and single engine license. Instrument rating. A & E license. 3000 hrs. accident free flying time. 2000 hrs. transport flying. Age 30. % Box 557, Flying.

A & E MECHANIC, single-multi commercial pilot, Beechcraft specialist, 8 yrs. experience. Details on request. O. B. Revell, 215 Beechwood, Wichita, Kansas.

TURN that job over to an engineer-pilot with a well-rounded background in aviation. Has B.S. degree in Aeronautical engineering, a Capt. in Air-Reserve, graduate Advanced Flight School, Instrument Instructor's School, ATSC Engineering School, 1500 hours, commercial license, single and multiple engine rating. 3½ years military experience as flight and ground instructor, engineering officer. Capable of directing personnel. Write Box 558, % Flying.

A & E MECHANIC, graduate of approved school, some experience. Prefer midwest. Curtis Cleland, Montevideo, Minn.

AIRLINE Transport Pilot, age 29, 3845 hrs. 2 yrs. major airline experience, ex N.A.T.S. P1. Commander, college grad, desires executive pilot's position. Excellent references. E. M. Mundy, 11 Virgil Walk, Long Beach 3, California.

AIRLINE Pilot, age 26, 12 yrs. experience, 6700 Certified flying hours. Hold all ratings to my Pilot's license. Former T.W.A., Naval Transport, and U. S. Airlines Pilot. Graduate Dallas Aviation School, 3 yrs. College Aeronautical Engineering. Am married and now employed by major Airline as pilot. Desire Company or Corporation flying position. Will answer all offers. Box 562, % Flying.

COMMERCIAL Pilot, single engine, A & E Mechanic, three years college, business experience, married. Dean Portz, 1011 North Cheyenne, Tulsa, Oklahoma.

PHOTO Mapping Pilot. Trained by the 16th Photo Sqdn. Experienced in Precision Mapping. Twin multi engine commercial license. Free to travel. Al Crawford, 622 W. Long Ave., Du Bois, Pa.

PILOT-MECHANIC with successful business experience, 8 years advertising agency. Commercial pilot, single, multi, land, flight instructor, instrument ratings, A&E mechanic, all ground instructor ratings, parachute rigger. ATR written completed. 2635 accident-free hours. Instructed 1100 hrs., Cubs CPT, navy elementary. Air Transport Command veteran, 901 hrs. C-54, trans-Pacific. 4 months C-54 test pilot, some twin-engine time. 220 hrs. instrument. 73 actual, 93 link, remainder hood. 400 hrs. night. Spartan graduate A&E, Airport Management, Class 1 physical. Married, mature judgment, reliable, good personality. Desire position executive pilot, airport manager, or where qualifications could best be used. Ed W. Hamann, 2259 S. St. Louis, Tulsa, Oklahoma.

FORMER Canadian airline captain desires position, fully licensed, instrument rating, etc., over 5000 hours, DC-3, Lockheed, fully conversant all weather, range flying, 31 years of age, married, go anywhere, interested So. American operations, executive transport pilot. Box 568, % Flying.

EX-MARINE owns Cessna "140" with 2-way radio and all accessories. Desires to fly to make money. Lew Young, 110 8th St., Watsontown, Pa.

EX-ARMY Pilot desires flying position with corporation or individual. Commercial license. Willing to work in office part time. Vincent E. Johnson, Bradford, Pa.

HELP WANTED

ALASKA, The Last Frontier offers thousands of opportunities. $1 brings 1947 Copyrighted Report describing potential opportunities. Listings of firms in Commercial fishing, Mining, Aviation, Construction. Pertinent facts about Prospecting, Fur Farming, Homestead Lands. Tips for application. Free map of Alaska. Alaska Opportunist, Dept. F, P. O. Box 883, Hollywood 28, California.

INTERESTED in Latin American & foreign employment? $1 brings Foreign Service Directory just off the press listing Oil, Mining, Aviation, Construction, Transportation, Manufacturing concerns by Personnel Expert. Hot tips for immediate application. Global Reports, Dept. F, P. O. Box 883, Hollywood 28, California.

HELP Wanted! "Hot leads" rushed by Airmail on best paying opportunities. Confidential reports cover aviation and other fields, domestic and foreign. Only $1.00. State your interests. Research Services, Main Post Office, Box 426, St. Louis 3, Missouri.

EMPLOYMENT Aid: A proven method that beats competition. Trial registration, $1.00, brings list of positions and instructions for application. Aviation Employment Service, F-G, Adams, Mass.

AIRLINE Jobs. Recent, comprehensive survey of airline employment opportunities tells you what jobs there are, and how to get them. Qualifications, salaries, where to apply. $1.00. Christopher & Co., Dept. C., Box 118, Cooper Station, New York 3, N. Y.

MISCELLANEOUS

NEW Canopy Hangar Door, For Sale: Make: #2534 manufactured by the Overhead Door Corporation of Hartford City, Indiana. Door Size: 40'6½" x 10'1½" with (1) pass door left hand facing from inside. Controls: (1) Model "M", Type "C", ¾ H.P. control for left side mounting (current 220 Volt, A.C., 60 cycle, 3 phase); and (1) thermal cut-out switch #120. Total Weight: Approx. 4,754 lbs. Price: $1850 complete, FOB Peoria, Illinois. Terms: $850 down, balance in 10 days from shipping date. C. Iber & Sons, P. O. Box 13, Peoria, Illinois.

LEATHER Name Patches gold stamped, with Military or Civilian wings, $1.00, 3 for $2.00. Clubs, Schools, any design. Julie's Leathercraft, Lone Tree, Iowa.

AIRCRAFT Photographs. Sample photo and illustrated 52-page catalogue listing nearly 5000 aircraft from World War I and II. 25c. Aeroplane Photo Supply, Box 195, Toronto, Canada.

PILOTS: Your name cleverly drawn in cartoon. 8 x 10, $1.00. State plane you fly. Scott's Studio, Somerville, Tenn.

FREE 2x2 Color Slide and Fine Grain Negative! Send self addressed stamped envelope for samples and catalog. Slidecraft, 5855 E. Hollywood Blvd., Hollywood 28, Calif.

120 DIFFERENT Military Aircraft of all nations illustrated on 18" x 24" posters with three plan views (to scale) and one flight photo for only $2.95 per complete set. Just about 2c each. 40 assorted for $1.98 postpaid. Two samples Free. Send 25c to cover mailing. Karl Ort, Dept. 1, York, Penna.

AUTO-PED motorscooter $10; Midget Racer less motor $14, Midget track racer, new motor $65. Indian '45 motorcycle $45. Indian Chief $40. Harley single engine $4. Whizzers $30 up. 4500 small tires $1 up. Mail order only. Plenty brand new and surplus gasoline engines, motorscooters, midget cars. Send 25c for Big War-Bargain Catalogue Number 23, just out, listing the above and over 400 other bargains in motors, motorscooters, midget racers, parts, plans, etc. (35c by First Class Mail.) Midget Motor Directory, Athens, Ohio.

AIRPLANE Photographs: Send fifteen cents for sample photograph and new list catalogue. Aero Research Laboratories, 2504 W. Cherry Street, Milwaukee 5, Wisconsin.

FLY in Texas this winter with: Associated Aircraft Operations, R. No. 3; Waco, Texas, Municipal Airport. Flight Training: Private, Commercial, Instrument, Flight Instructor, Multi-Engine.

AIRLINE Baggage Stickers—6 different 25c, 18—$1.00, 28—$2.00. Airlabels, Dept. FL, 1145 St. Charles, Villa Park, Ill.

"BURN WATER." Army planes conserve fuel, gain hundreds of horsepower. Now your private plane or automobile can benefit! Easily convert any car, tractor, motorcycle, or plane (1917-1947) to amazing Water Injection (like late war planes) for only $1.00 cost. Much more power, much less gas, saves oil, more speed, less carbon, cooler smoother engine! Copyrighted quick-installation Manual, complete diagrams, including detailed direction, operating instructions, etc. Only $1.00 postpaid. Newhouse Industries, 5941-G Hereford, Los Angeles 22, Calif.

BUSINESS OPPORTUNITIES

FOR Sale: Alaska Bush Operation. Planes, hangars, equipment, buildings. Price. $75,000.00. Box 532, % Flying.

FOR Sale: 40 A. land, hangars, shop, 8 aircraft, grossing $55,000, will help finance. Must sell, Western Ohio. Box 563, % Flying.

BEAUTIFUL River - bordered 278 - acre airport, resort, in rich bottom farm, on famous river, in scenic playground section near Lake of the Ozarks and Bagnell Dam, large modern home, good big barn, fine private plane landing facilities—extraordinary combination indeed at $30,000! Splendid location adjacent to great playground of midwest, 2 long "L" runways, well drained by more than 7,000 feet of tile, heavily sodded bluegrass, large macadam warm-up strip; dandy 7-room white frame fully modern house, currently used as tavern and lunch service, 50x75 ft. barn; gravel road, only 1½ mile U.S. highway, 1¼ hours state capital city; 160 rich bottom cultivated, woven wire fencing, 100 wooded; owner includes 6 saddle horses, 4 new boats, all for $30,000, ⅓ down. Special with big free Winter catalog many states. United Farm Agency, 1408-CF Consumers Bldg., Chicago 4, Ill.

In replying to Box Numbers, be sure to address letters to
FLYING
185 N. Wabash Ave., Chicago 1, Ill.

INDEX OF Advertisers

FEB. 1948

AAF Publications Co. 80
Aero Bolt & Screw Company 83
Aero Industries Technical Institute 61
Aeromatic Propeller Dept., Koppers Co., Inc. 59
Aeronautical University 81
Air-Parts, Inc. 84
Air Photo Supply Co. 80
Aircraft Owners & Pilots Association 73
American Extension School of Law 74
American Flyers 76
American Schools of Aircraft Instruments 6

Beech Aircraft Corporation 12
Bogue, Benjamin N. 74
Brayton Flying Service 77

Cal-Aero Technical Institute 51
Cessna Aircraft Corporation 53
Champion Spark Plug Company 49
Cities Service Oil Company 65
Consumers Clothing Co., Inc. 84
Currey School of Aeronautics 79

Edmund Salvage Co. 76
Edo Aircraft Corporation 67
Embry-Riddle School of Aviation 75
Esso Aviation Products 10

Flightex Fabrics, Inc. 11

Goodrich Company, B. F. 3
Goodyear Aviation Products 47

Illinois School of Watch Repairing 84
Indiana Technical College 80

Jeppesen & Company 83

Lear, Incorporated ..... Second Cover
Lincoln Aviation Institute 82
Lyon, Thoburn C. 72

Martin, Glenn L., Co., The ..... Third Cover

Northrop Aeronautical Institute 57

Pacific Airmotive Co. 55
Pa-Kette Radio Co., Inc. 74
Pan American Navigation Service 89
Phillips 66 Aviation Gasoline 5
Pilots' Supply Co. 82

Randolph & Beavers 83
Roosevelt Aviation School 83
Ryan Aeronautical Company 7

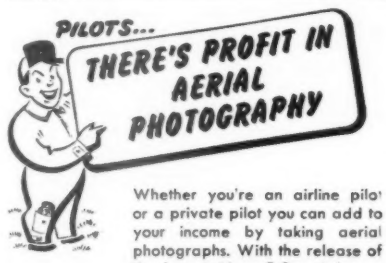
Spartan University of Aviation 9
Standard of California 90

Texas Engineering & Mfg. Co. ..... Fourth Cover

University of Denver 68

War Assets Administration 71
Warner Sales Company 80
Weems System of Navigation 74
White Plains Watch Company 81
Wynn Oil Company 8

Ziff-Davis Publishing Co 69



Whether you're an airline pilot or a private pilot you can add to your income by taking aerial photographs. With the release of the famous Navy F-8 aerial camera this fascinating and profitable business is now within the reach of all pilots. The price for this superb professional camera is amazingly low.

F-8 AERIAL CAMERA with Wollensak F/5.6, 15-inch fully corrected lens. Shutter speeds from 124th to 400th of second. Uses magazine roll film 24' long. Photo size: 5"x7". Focal plane shutter, exposure counter, fingertip shutter release. Complete with case. Like new.....**$175.00**

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AN-6 GUN CAMERA, 16 mm., electrically operated, 24-volt, f/3.5 Eastman or Wollensak lens. Still in original package.....**$30.00**

AN-6 GUN CAMERA, with parts and instructions for converting to 15 volts. New.....**$35.00**

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LATEST WAR SURPLUS RELEASES OF AERONAUTICAL EQUIPMENT

HAMILTON MASTER NAVIGATION WATCH, 23-jewel precision watch with sweep-second hand which can be set to the exact second. 24-hour dial, temperature-position compensation. Used by AAF and airlines. New, **$67.00**. reconditioned, **$27.00**

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LONGINES WITTNAUER CHRONOGRAPH, with 30-minute elapsed time recorder, sweep-second hands. Shock- and water-resistant. Stainless steel case. 17-jewel. **$71.50**, tax included.

LONGINES WITTNAUER CHRONOGRAPH, with 12-hour elapsed time recorder, sweep-second hands, fluorescent numerals. **$125.00**, tax included.

LONGINES CHRONOGRAPH, stainless steel case, 12-hour elapsed time recorder, 12-hour dial. A beautiful and accurate watch. **$200.00**, tax included.

ASTRO-COMPASS, standard AAF and airline instrument for obtaining true heading, relative bearings, compass deviation, etc. Original cost, $87.50. For both air and marine navigation. Complete with case, mounting base.....**$8.75**

PIONEER APERIODIC MAGNETIC COMPASS, for aircraft or boats. Original cost, $150.00. Horizontal reading, rotatable verge ring for presetting heading. Will not oscillate. New.....**$24.50**

FAIRCHILD A-10-A SEXTANT, with electric automatic averager. Adjustable bubble, lights for night use. Complete with telescopic eyepiece and all accessories. Reconditioned, **$17.50**; like new, **$27.50**; new **$75.00**.

FAIRCHILD A-10 SEXTANT, same as A-10-A but with manual averager. Reconditioned, **$12.50**; like new, **$47.50**.

BAUSCH & LOMB A-8-A SEXTANT (illustrated), for both marine and air navigation. A precision instrument. Reconditioned, **$27.50**, like new.....**$49.75**

(NOTE: All sextants include instruction booklets and each instrument is personally checked by Charles A. Zweng before being sent out.)

We stock all computation tables, almanacs, maps and equipment used in celestial and dead reckoning navigation. Write for a free, illustrated folder of our complete stock.

Pan American Navigation Service

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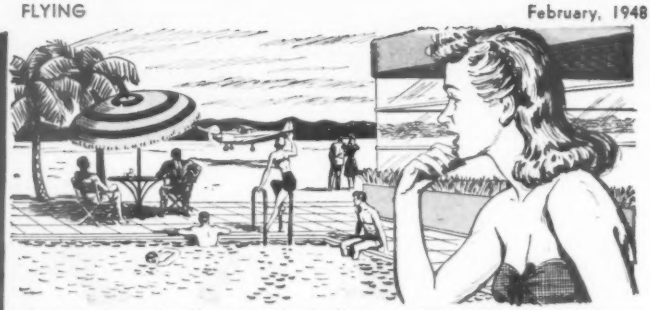
Standard of California's PLANE FAX



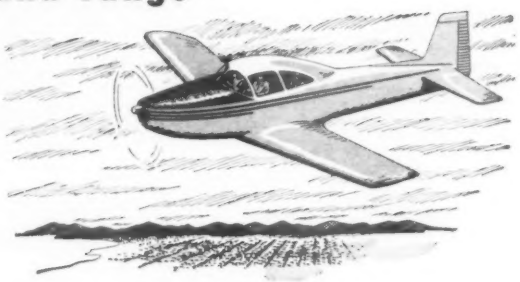
A page of service tips for private flyers and fixed-base operators

How to double the period between oil changes

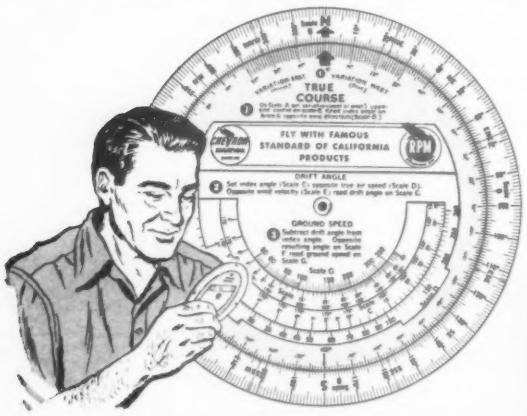
Heat and oxygen are the things that damage ordinary aviation engine oil. They bring about a chemical change that causes sludge, making frequent oil changes necessary. RPM Aviation Oil, however, contains an oxidation inhibitor to help prevent the formation of gum and sludge. That's why, with "RPM" you can lengthen the time between oil changes to 50 hours or more, twice the usual change period.

High flyers get maximum speed and range

By cruising a light plane at from 6,000 to 9,000 feet you'll get higher speed and longer range. This is because lighter air density at high levels decreases drag. When flying above 5,000 feet lean the carburetor mixture until r.p.m. decreases, then enrich it enough to recover loss of r.p.m. For maximum efficiency, stick with Chevron Aviation Gasoline. It's balanced for all 'round performance.



Free flight calculators offered by Standard Airport Dealers



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